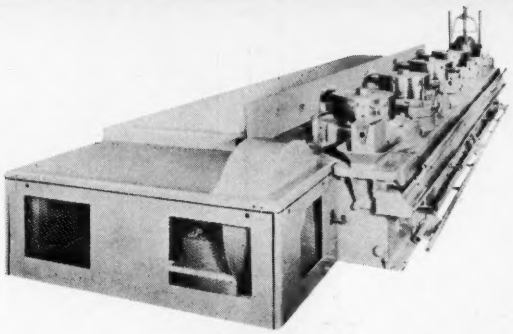
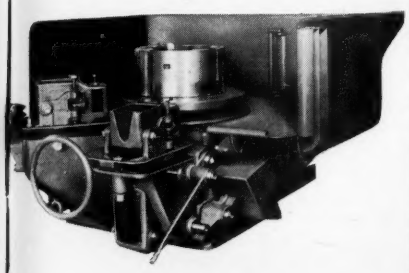
MARCH 1951

WIRE AND WIRE PRODUCTS

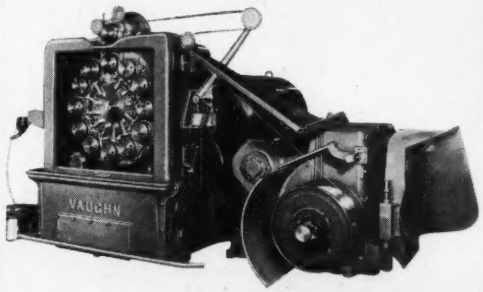


MOTOBLOX®



MOTOBLOC®

Each a masterpiece of modern, high-speed ***Productivity***



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Vaughn®

WIRE DRAWING MACHINERY

Study the performance features of today's Vaughn machines and you'll note dozens of reasons why it will pay you to re-equip for profits with VAUGHN. We'll make comparisons easy by presenting the actual facts at your convenience. Write!

The VAUGHN MACHINERY COMPANY, Cuyahoga Falls, Ohio, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

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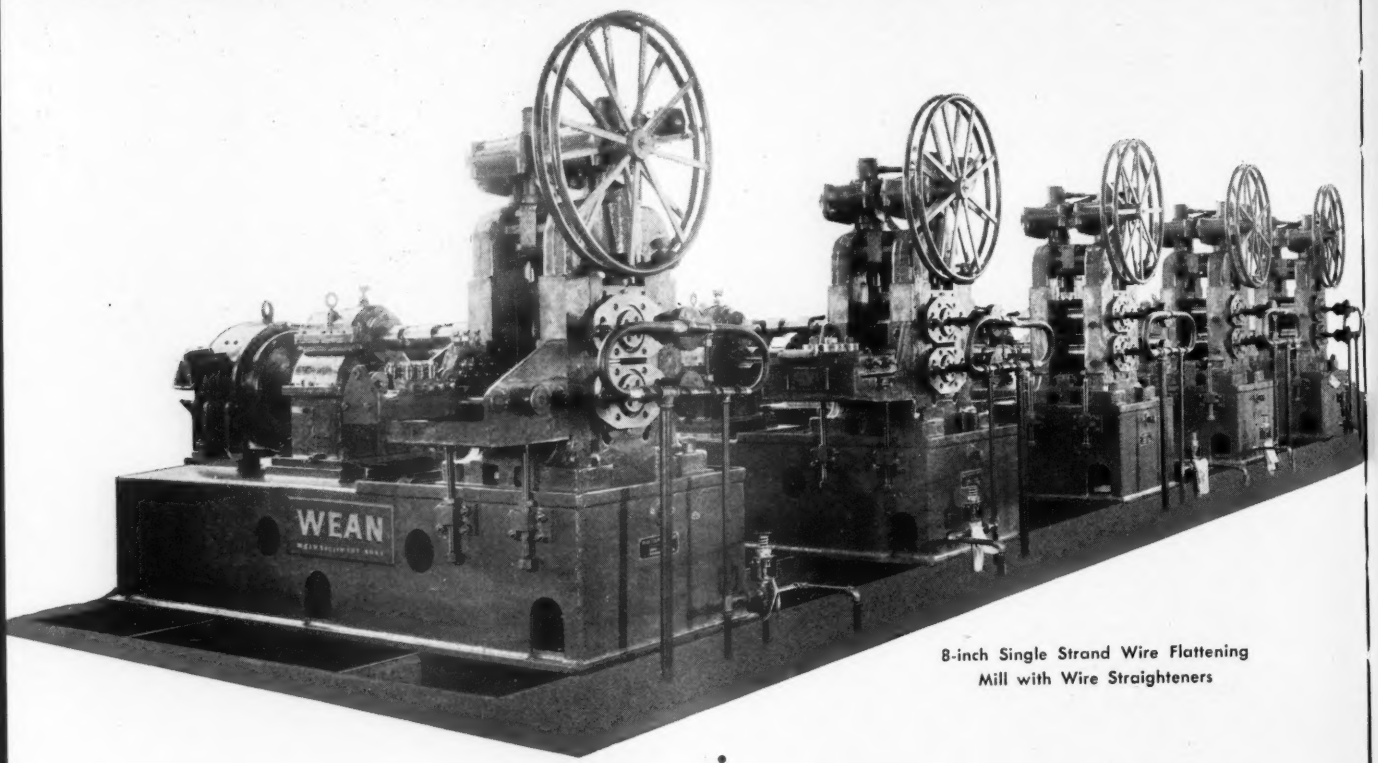

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Complete Installations for Electro Galvanizing, Hot Dip Galvanizing, Patenting, Tinning, Wire Flattening, Nail Galvanizing and Blueing.

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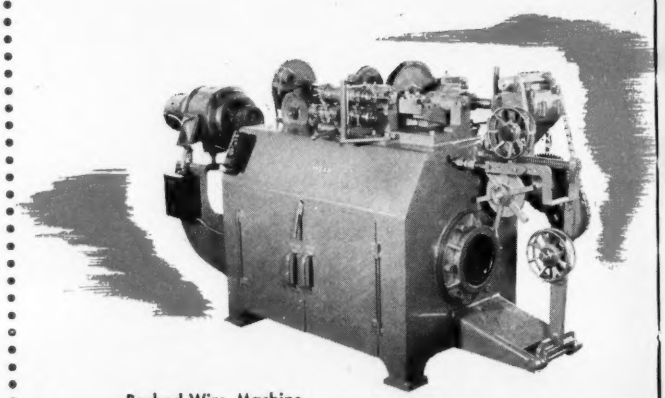
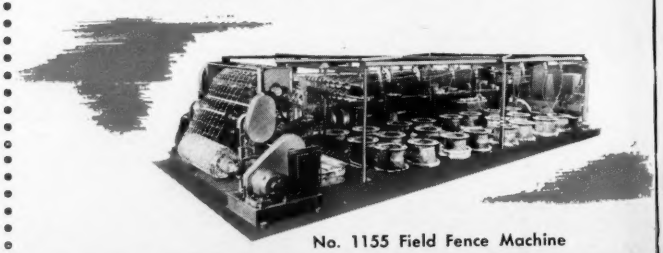


Barbed-Wire Machine



No. 1155 Field Fence Machine

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Faster Finishing Time
... with minimum work

2 Finishing Steps Eliminated
... on sizes R-3, 4 & 5

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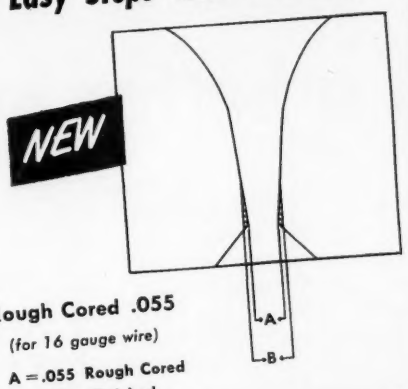
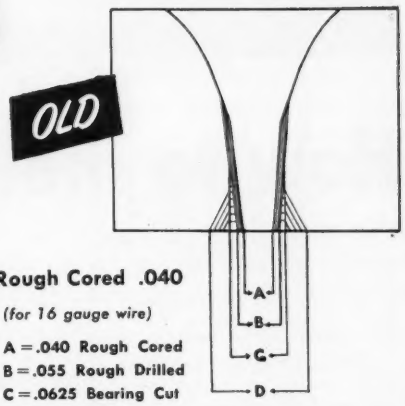


Rough Cored .055
(for 16 gauge wire)
A = .055 Rough Cored
B = .0625 Finished

Twice as Many Steps in Finishing Old Style Dies



Rough Cored .040
(for 16 gauge wire)
A = .040 Rough Cored
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C = .0625 Bearing Cut
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FIRTHALOY
SUPER-STANDARD FEATURES:

1. New, Higher nibs
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The new standards are typical of Firth Sterling's everlasting efforts to improve operating economies in wire mills. You can depend on Firth Sterling to help you produce Better, Faster and Cheaper.

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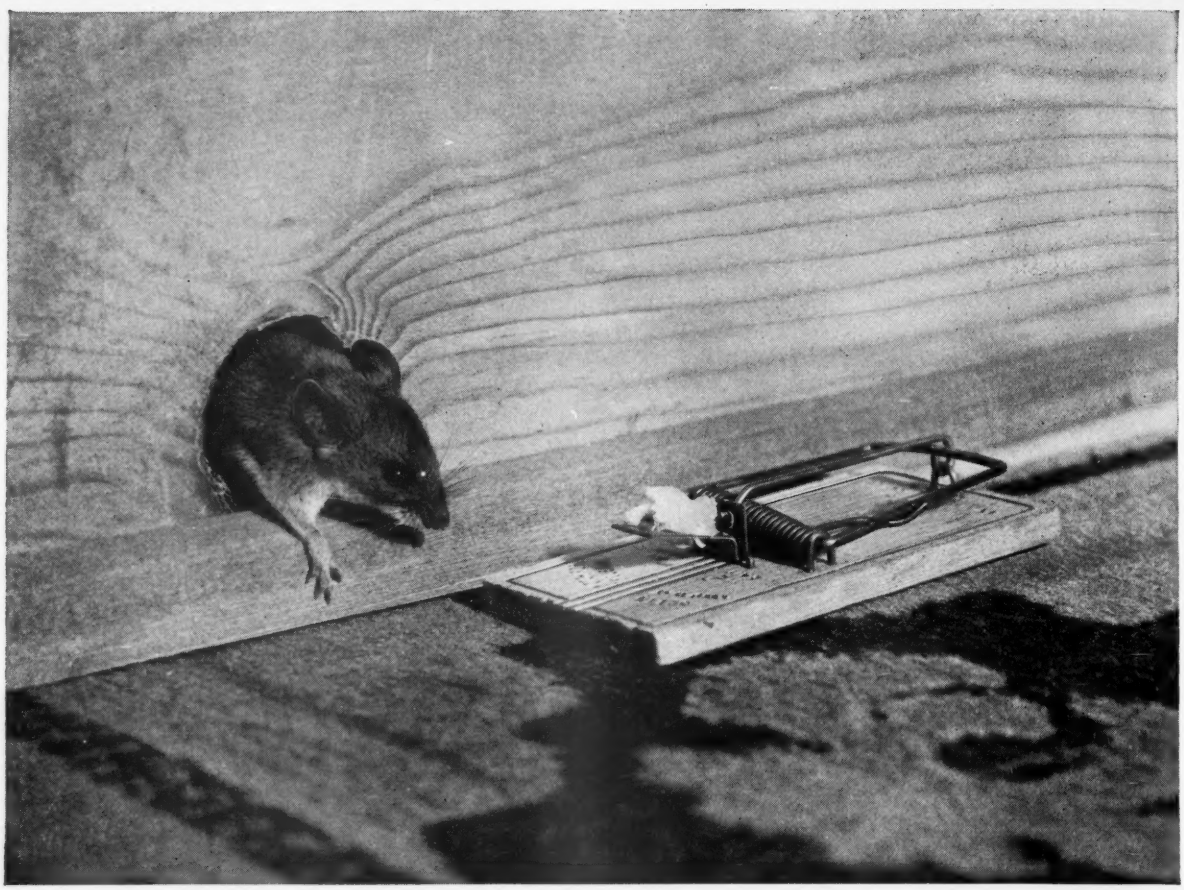

How to make a better mousetrap

If you want to make a better mousetrap —or any kind of better product that depends on special-purpose, high-carbon wire—we suggest you talk with a Bethlehem metallurgist. Let him study your needs and recommend the exact grade that will give you the right degree of strength and springiness.

We make many grades of wire for use in mechanical springs. The exact kind of steel depends on the use—the amount of forming, coiling, and deformation required, the expected life of the spring, the load and stress range, corrosive conditions, and other factors. Some grades are hard-drawn; others are spheroidize-annealed or given whatever special treatment is required to do the job.

Whether you need "specials" in wire, or the more ordinary grades, we'll gladly give you the benefit of our lifetime of experience in wire-making. Perhaps one of our engineers can be of assistance to you right now. Our nearest sales office is at your service.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★ **BETHLEHEM WIRE** ★

WIRE & WIRE PRODUCTS, Vol. 26, No. 3, March, 1951, Publication Office at Orange, Conn. Executive Office 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, at the Post Office, Orange, Conn., under the act of March 3, 1879.

101 YEARS OF SERVICE

In Recognition
Of the Founders, Managers and Employees of this Company who have so fully contributed to the Economic and Social growth of their Community, the State of Connecticut and the United States of America for more than
One Hundred Years
THE MANUFACTURERS ASSOCIATION OF CONNECTICUT, INC.
Awards this CERTIFICATE of APPRECIATION to
The Hartley Tool & Die Co.
Established in Connecticut 1850
In Witness Whereof these presents have been signed, sealed and delivered by The Manufacturers Association of Connecticut, Inc., This twelfth day of September, A.D. One Thousand Nine Hundred and Fifty
PRESIDENT

With five generations of Hartleys ever striving to serve you better and more efficiently.

It is small wonder, then, that Hartley's Tungsten Carbide Dies have attained a degree of excellence that spells savings for you in your wire drawing operations.

The Hartley Tool & Die Compan is proud to reproduce the certificate recently awarded to it by the Manufacturers Association of Connecticut for their long period of successful service to its community, the state and to industry.

Long-experience and ingenuity in the manufacture of wire drawing dies and other standard carbide products has made Hartley Dies both lower in first cost and more economical in wire, tube, heading and other production costs.

You need not guess as to the quality of your dies if they bear the HARTLEY trade-mark.

Special and shaped dies engineered to meet your needs.

Send for catalog and price list on standard carbide dies.

WATCH FOR THE HEART ON *Every* DIE

your assurance of highest quality and service

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Made with One Object in View...

To Give YOU the Utmost of Service

In order that you may have the best in DRAWING DIES, only PREMIUM GRADE CARBIDE NIBS are used, properly encased to assure concentricity.

Supplied ***semi-finished*** at ***rough-drilled*** die prices to within .001"-.002" of the finished die sizes. This makes for great economy in your die-room by eliminating costly ripping from standard rough cored hole sizes. All you need to do is to size and polish.

This innovation in carbide die manufacture is important to you—***it saves you time and money.***

EASTERN CARBIDE CORPORATION'S COLD HEADING DIES, QUILLS and CUT-OFF KNIVES are made of the same fine materials and with the same skilled workmanship. Use them wherever possible and benefit from ***long uninterrupted runs.*** We supply a complete line of tooling for the cold-heading industry.

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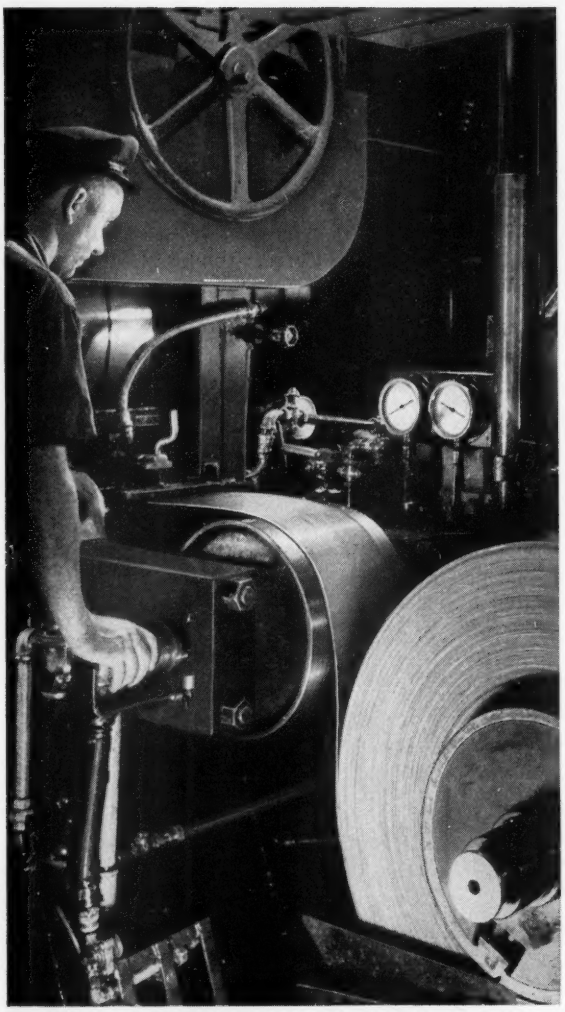
Complete Carbide Sales and Service

SPRING STEEL



Roebling Cold Rolled Spring Steel brings fewer machine stoppages . . . fewer rejects

YOU SAVE MONEY with Roebling Cold Rolled Spring Steel because it's of absolutely uniform quality. Every inch is just like every other inch, dimensionally and in physical properties. Service records show that it cuts down preparation time . . . gives you a better product and better production. And Roebling Cold Rolled is made annealed, hard rolled untempered; scaleless tempered; tempered and polished; tempered, polished and strawed; and tempered, polished and blued.

Large quantities of Roebling's specialty wires — flat, round and shaped — are required today in the national rearmament program. Roebling, however, is one of America's largest manufacturers of specialty wires, and we shall always do everything possible to meet your requirements. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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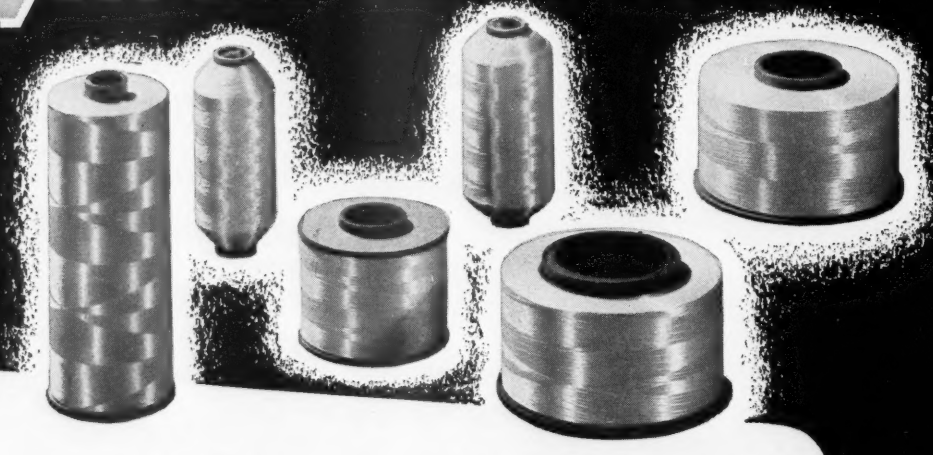
Low-Twist Vitron GLASS YARNS



Cut material, time and inventory costs

To meet a specific need of many manufacturers, Glass Fibers originated VITRON 300 glass yarn—a new strand size—in low-twist constructions. So rapidly are low-twist 300's becoming a standard of the industry, that Glass Fibers has also made available low-twist 450's and 225's as well, all in a complete range of constructions and packages.

In this time of increased nation-wide production for preparedness, extra fiber supply is important. Low-twist yarns can be turned out by the manufacturers of basic glass fibers at a faster rate, thus making more insulating material available to the electrical industry.

This product improvement and cost saving can easily be applied to your magnet wire production. Write for information and engineering consultation.

In wire insulating plants where VITRON low-twist yarns are in use, manufacturers find these money-saving advantages.

Cuts Material Cost—as much as 20% to 40% over previously used yarns.

Saves Time—because low-twist yarns can be applied faster, and build-up can be adjusted by varying pull-out or flyer speeds to bunch or spread the same yarn.

Reduces Inventory—since low-twist packages can be used for a wider range of jobs, fewer types are needed, reducing yarn inventories by as much as one-third.

Vitron® GLASS FIBER

ELECTRICAL INSULATING MATERIALS

GLASS FIBERS INC.

1810 Madison Avenue, Toledo 2, Ohio

Pittsburgh Steel

announces new facilities for

Oil Tempered Wire

to better serve its customers

Now, **Oil Tempered Wire** has been added to the extensive line of manufacturers wire which Pittsburgh Steel Company has been serving to industry for nearly half a century. The same high Pittsburgh quality that stems from rigid control of its own raw material and long experience in steel production prevails in this new **Oil Tempered Spring Wire.**

Pittsburgh **Oil Tempered Wire** is available in a complete size range, either flat or round, in coils or straightened and cut lengths. Also, Pittsburgh hard drawn **MB** spring wire will be available in a complete range of sizes.

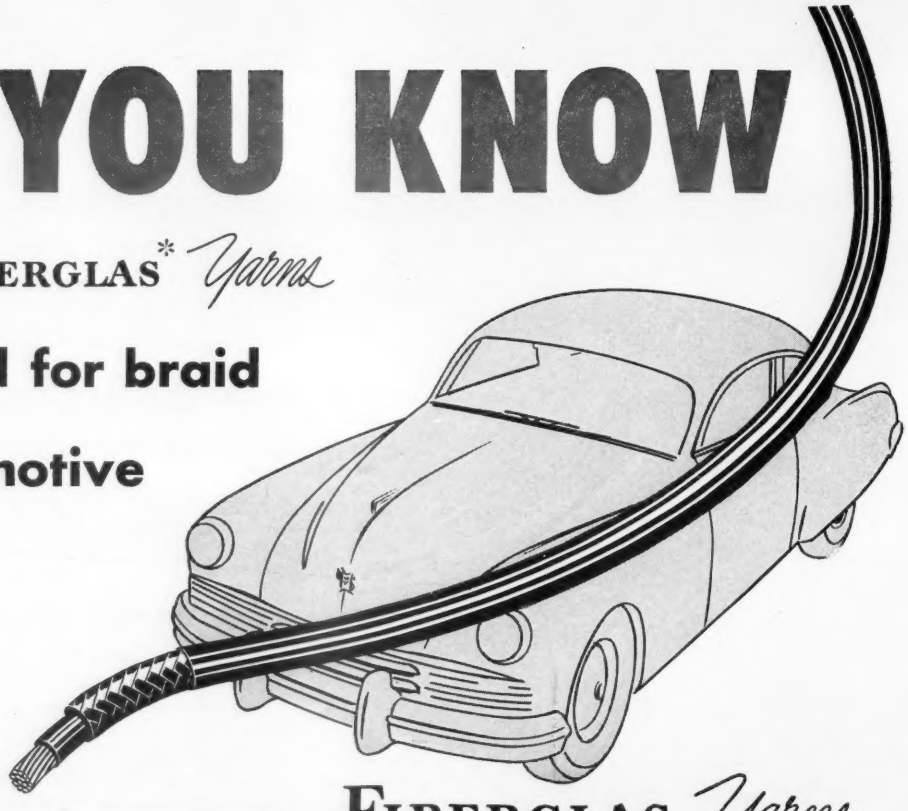
For **Oil Tempered Wire** and **Hard Drawn MB Spring Wire** that is uniform in size, finish, mechanical and metallurgical properties, specify **Pittsburgh.** Write now for information to Department W, Pittsburgh Steel Company, Pittsburgh 30, Pa.

Pittsburgh Wire

A product of Pittsburgh Steel Company

DO YOU KNOW

why FIBERGLAS* *Yarns* are used for braid in automotive wire?



Along with the entire electrical industry, Owens-Corning Fiberglas Corporation is faced with increasing civilian and military demands. While we cannot now supply all the materials our customers want, we are substantially increasing our production facilities. Therefore, we believe it to your future best interests to consider this new and recommended use of Fiberglas yarns.

FIBERGLAS *Yarns*

- ***WILL NOT BURN*** *... give extra protection in soldering*
- ***WILL NOT ROT***
- ***HAVE EXCELLENT BRAIDING EFFICIENCIES***
- ***HAVE GREAT TENSILE STRENGTH***
- ***GIVE SMALLER DIAMETER*** *... plus good deformation resistance*
- ***ARE LOW IN COST!***

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers

For complete information about Fiberglas yarns for this and other uses, write Owens-Corning Fiberglas Corp., Electrical Sales Division, Dept. 875, 16 East 56th Street, New York 22, N. Y.

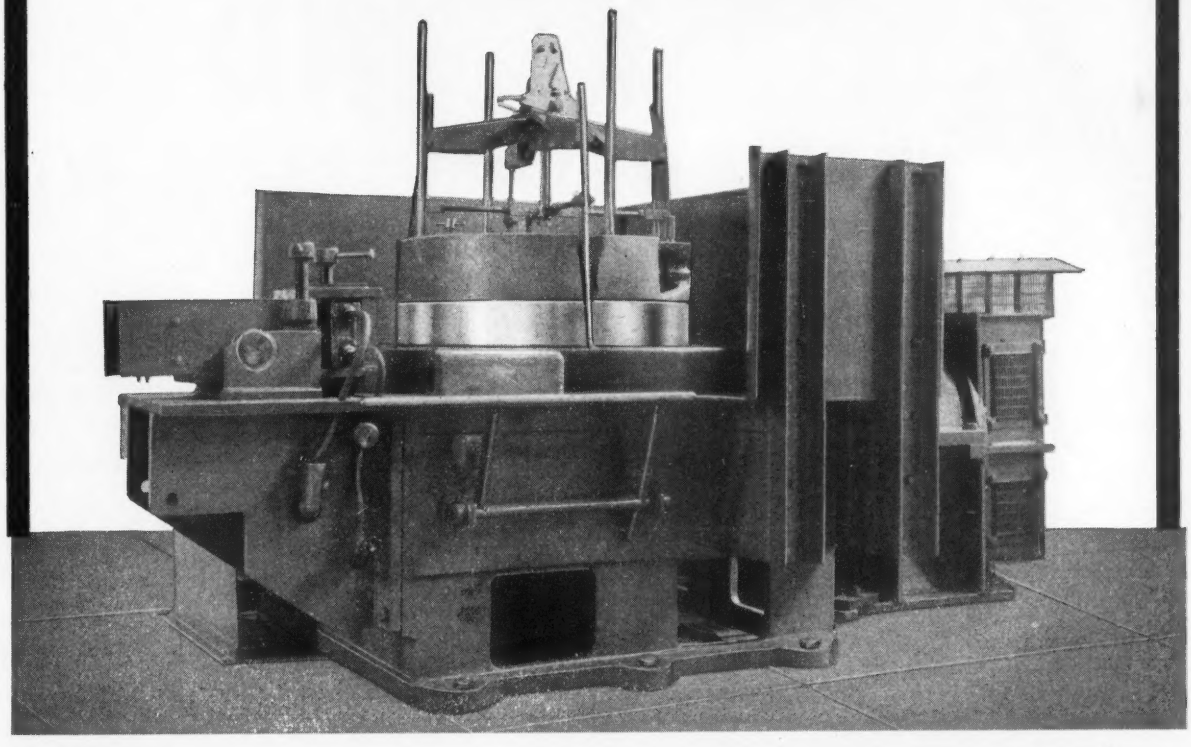
OWENS-CORNING FIBERGLAS *Yarns*

FIBERGLAS IS IN YOUR LIFE...FOR GOOD!

NOW—TREMENDOUS SAVINGS

in maintenance costs!

Marshall Richards V20 Bull Block
has replaceable hardened steel inserts



HERE'S A DEVELOPMENT of prime importance today . . . hardened steel *replaceable* inserts at the points where greatest wear occurs in the block . . . maintenance costs slashed to a fraction of what they used to be!

The Marshall Richards V20 is a heavy vertical Bull Block designed to draw mild steel from inlets up to approximately $1\frac{1}{16}$". Blocks ranging in size between 28 and 36 inches, and motors up to 100 H.P., can be accommodated. Drawing speeds are readily variable to any desired rate between 100 and 300 feet per minute.

Full information about the V20 or the complete line of Marshall Richards wire drawing equipment will be sent you promptly upon request.

MARSHALL RICHARDS MACHINE COMPANY, INC.

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● Have you ever noticed the spiral binding on your stenographer's notebook? Chances are, it's made of KOKOTE . . . an unusually bright steel wire with a chrome-like lustre. Because KOKOTE has a desirable degree of stiffness, it is used by one of our customers to make these wire bindings. Not only books, but this manufacturer's reputation—and ours—are inevitably bound with it. We feel, therefore, the greatest responsibility toward our customer and his wire-fabricating problems.

There is this kind of "family" relationship between Continental and the many manufacturers we supply with lustrous KOKOTE . . . whether they use our wire for spiral bindings, broom wire, or paper clips. We act in the belief that business success ultimately depends on SERVICE . . . so you'll always find us ready and willing to help you. If you are troubled by a particular problem, please feel free to write us, without obligation.

CONTINENTAL STEEL

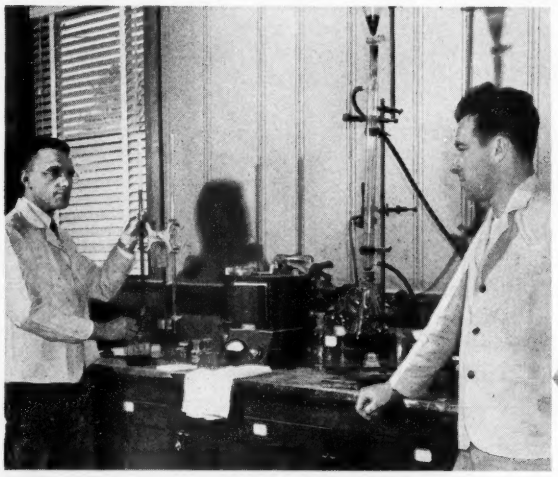
CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

MILLER RESEARCH PAYS YOU DIVIDENDS!

The famous "STEELSKIN" Brand, known and used throughout the world, consists of a line of specially engineered lubricants for all your drawing requirements.

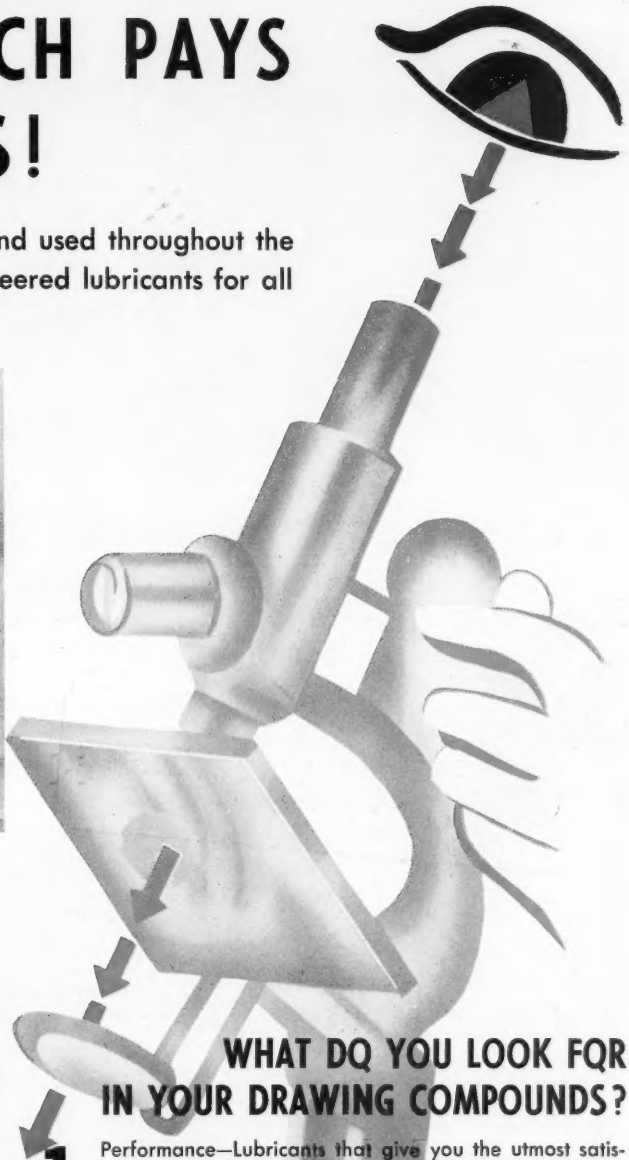


Lab. view showing Dr. H. Grey Verner, Ch. E., Director of Research, and W. C. Breidinger, Ch. E., Supt., Chg. Plant Process Control. It is here that advanced lubricants are developed for you.

Drawing compounds that make possible higher drawing speeds and lower production costs are a result of forty years of constant research and development. When you order "STEELSKIN" Compounds, you can be sure they are technically right — engineered to give you economical production.

Uses For "Steelskin"

Rope, screen cloth, nail, poultry netting, fence, needle, spring, tire bead, coat hanger and many other types of steel and alloy steel wires; copper, brass, nickel and other non-ferrous wires; and special lubricants for drawing all seamless tubing, stampings and deep-drawn parts.



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1. Performance—Lubricants that give you the utmost satisfaction in mill operations—quality control, superior finishes, improved die performance.
2. Economy—Miller's research has developed superior lubricants that save you as much as 1/3 to 1/2 on your drawing compounds — by scientific production methods.
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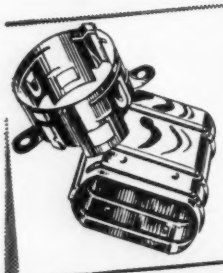
Wire · Tubing · Stamping · Deep Drawing Soaps and Compounds

WIRE AND STRIP PARTS
of almost unlimited form

can be produced faster and for less



STRIP PARTS

A wide variety of forms can be produced direct from coiled stock at speeds up to 9,000 parts an hour. Each component is completed in a single passage through the machine, and may save six or seven separate press operations.

WIRE PARTS

An almost unlimited range of wire forms can be produced at speeds up to 9,000 parts an hour. By means of change-parts these machines can be quickly converted from wire to strip forming or vice versa.

PAPER CLIPS

Clips of various shapes and sizes are produced at 180 a minute from coiled stock. It's only a matter of minutes to change the actual tools to produce clips of another shape, or change the complete assembly for a different size.

CHAIN

Knotted chain is produced at speeds up to 70 links a minute ; mattress chain at an average rate of 120 links a minute ; short link welded chain for ships, cranes, etc., is formed at speeds up to 110 links a minute, and automatically welded at rates up to 60 links a minute (according to size).

FENCE STAPLES

Staples are produced from coiled stock at 250 a minute in the smaller sizes and 125 a minute in the larger range. Points are pressed into shape ensuring better driving qualities than are commonly found with sliced cut-off points.

NAILS

Up to 700 nails a minute (according to size) can be produced on Heenan automatic nail presses. Round nails, oval brads, square, fluted or twisted nails can all be produced with a wide variety of head shapes, direct from coiled stock.

on HEENAN
automatic WIRE AND STRIP FORMING MACHINES

Write for illustrated catalogues of the equipment in which you are interested.

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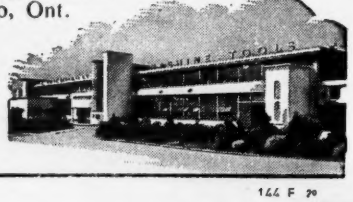
WICKMANS *of* COVENTRY ENGLAND



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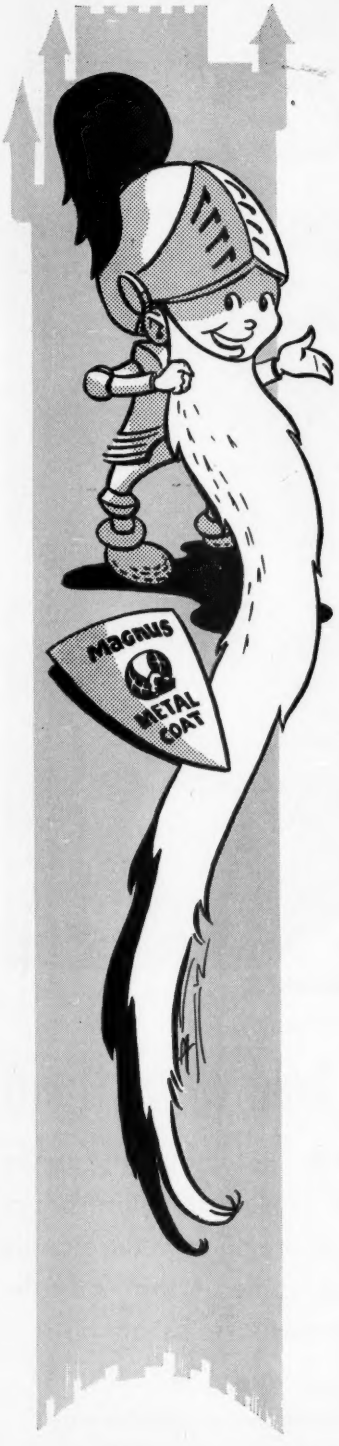

A WIRE COATING WITH "OLD AGE" SECURITY!

No matter how cheap *per pound* a coating compound may be, the real economy shows up in the frequency with which your tank must be renewed.

One of our customers, whose name we shall be glad to give you, recently renewed his tank for the first time AFTER FIVE MONTHS OF CONTINUOUS USE. We mention this, not because it is unusual for Metalcoat #267 to last so long, but because so many wire men are inclined to judge economy in coating by a lower cost per pound instead of tonnage of rod and wire coated through one tank of coating solution.

The average life of a freshly-made-up tank of Metalcoat #267 is three months, in contrast to other coatings which have to be dumped after three or four weeks. With proper rinsing facilities, and daily upkeep of the solution, four or five months' service may be expected. That, together with far greater die life, is the REAL ECONOMY in using Metalcoat #267—not to mention complete rust protection.

A "saving" of a couple of pennies per pound of coating compound is false economy when you must use from three to five times as much to coat the same tonnage of rod and wire. Metalcoat #267 has *proved* its economy of operation over the past several years—can you say the same of the coating you are using?

A Magnus Standardized PRODUCT

Metal Coating Division . . . .

MAGNUS CHEMICAL CO., INC.

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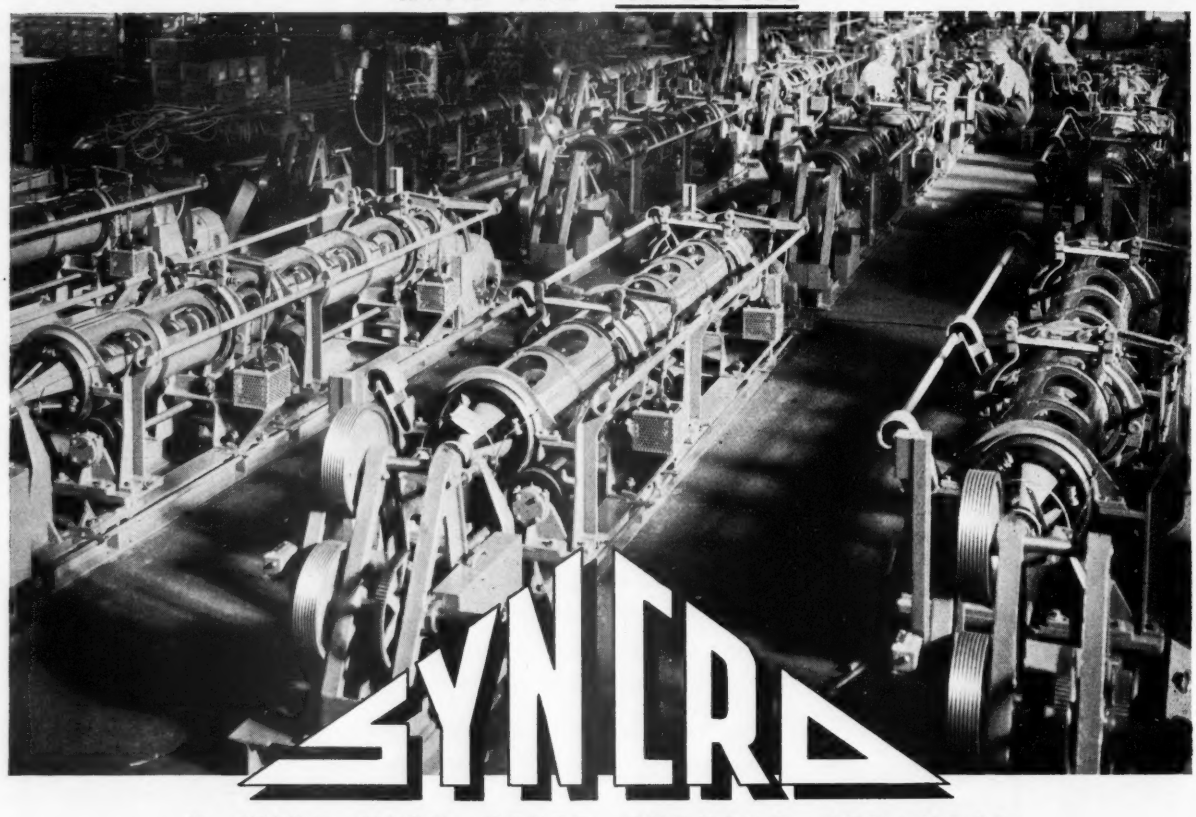
ACCELERATED

ROTOR SPEED

WITH THE IMPROVED



7 WIRE HIGH SPEED TUBULAR STRANDER

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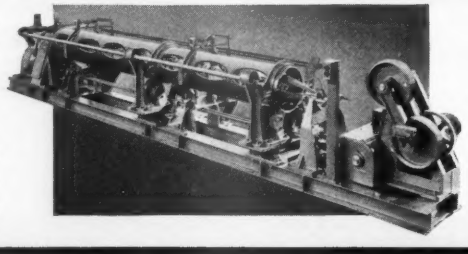

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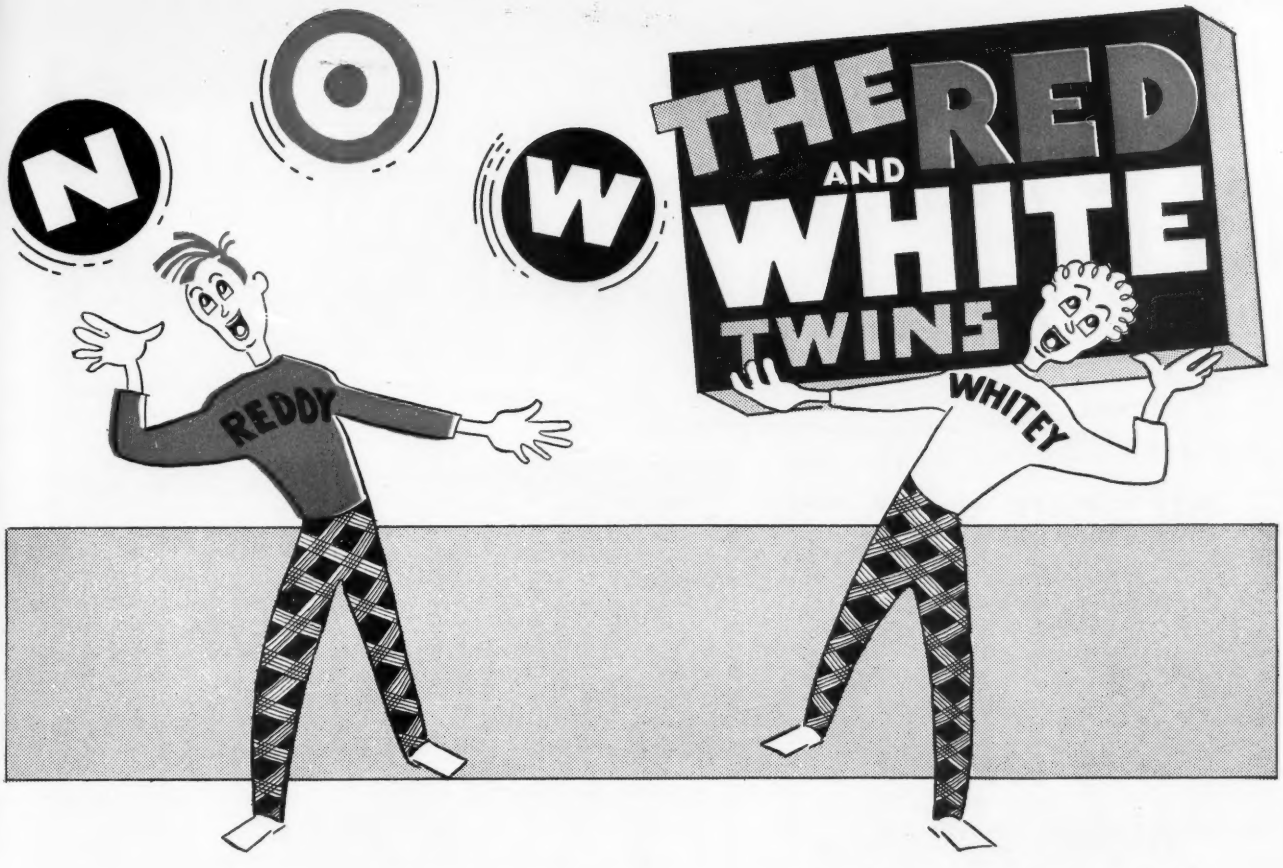

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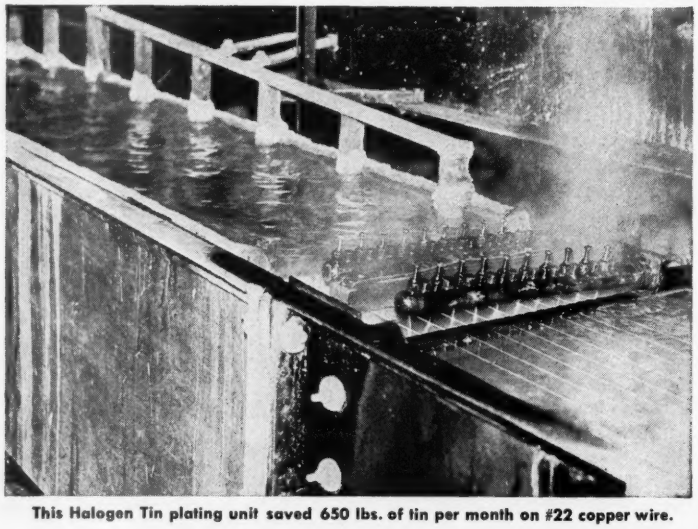

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The Wire Outlook

Ineptness, confusion and a lack of ability to think through to the consequences of determinations seems to characterize most of the Administration's actions. Instead of statesmanlike leadership, most decisions appear to be based upon the political considerations of what will be good for the party, rather than for our people as a whole.

The rail strike, while a domestic issue, was a good example of political mishandling. No exercise of either existing laws or of the power vested in the Army, as the current operator of our railroads, was brought to bear until the clamor of public opinion forced the Army to the decisive action it should have taken in the first instance. As a result, 100,000 tons of steel were lost to 1951's production, besides the uncounted losses to business of every kind. No one can be blamed but the Commander-in-Chief. He inherited and has tried to carry on a government by men instead of by laws, a precedent set by his predecessor to our country's great disadvantage.

The much-advertised "freeze" of prices and wages has turned out to be only a temporary halting of the upward spiral. New wage and price increases will be allowed. It is reported that the Government is afraid to make its orders too rigid for fear of putting too many manufacturers out of business. However, there are plenty of concerns, principally smallers ones, who are finding it right now very, very difficult to get the materials with which to carry on. Shortages for civilian production are increasing on every hand. In spite of the flexibility of the "freeze" order, all-out controls are considerably nearer and are likely to come soon. Until they do, the present policy can only create doubt and indecision as to the future.

Nut, bolt and rivet manufacturers as a group are pressing the N.P.A. for more steel and are hoping to be allowed to carry a 90 day inventory. The supply of nails and fencing is fast becoming acute and bale tie demand is developing at an unseasonably early date in anticipation of later shortages. Manufacturers' wire, while not plentiful, is somewhat less difficult to obtain. Wire rope, strand, netting and welded wire fabrics have been placed under inventory controls by the N.P.A. Wire rope continues to be readily available.

Quotas on wire for civilian uses are constantly narrowing and are being curtailed, particularly where zinc and tin coatings are involved. Some wire mills are very short on zinc. There isn't enough to go around. Rod supply is generally tighter and spring wire allocations are being carefully screened and reduced by the mills. While DO orders for wire are still more talked about than experienced, it is expected that more of these will be coming through in April. Communication wire and cable orders are among the highest as to percentage of rated order volume. Alloy wire volume is heavier, with demand for cold-headed fasteners building up constantly.

Many wire product manufacturers are turning handsprings to secure the wire needed to keep their plants busy and their personnel intact. Some layoffs will be inevitable. The scramble for wire has even included sending representatives to Europe to buy wire, with the result that foreign sources of supply are becoming sold out. It is also reported that the black market boys are operating again. How do they get the wire that legitimate customers of the mills need so badly?

The dual object of trying to keep up with both civilian and defense orders is keeping our mills busy and is pushing activity indices up almost to the post-war record level.

We may criticize our British neighbors for the "nationalization" of their basic industries, but that we are headed in that direction ourselves may be seen from a recently published list of some 54 Federal corporations that are engaged in businesses that compete with private enterprise. It may be bad for the British — may, in fact, be fatal in the long run — but it is also bad for us and is one of the phases of New and Fair Deal activities that requires liquidation.

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—from the Editor's Desk

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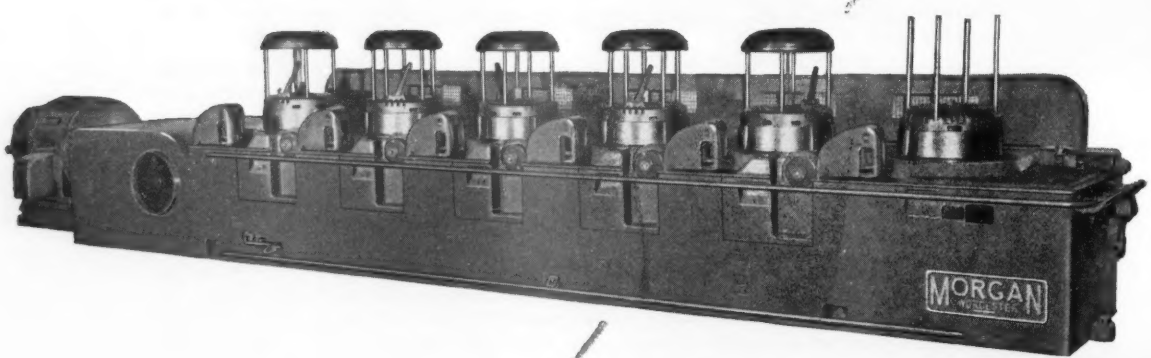

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 26 MARCH, 1951 No. 3

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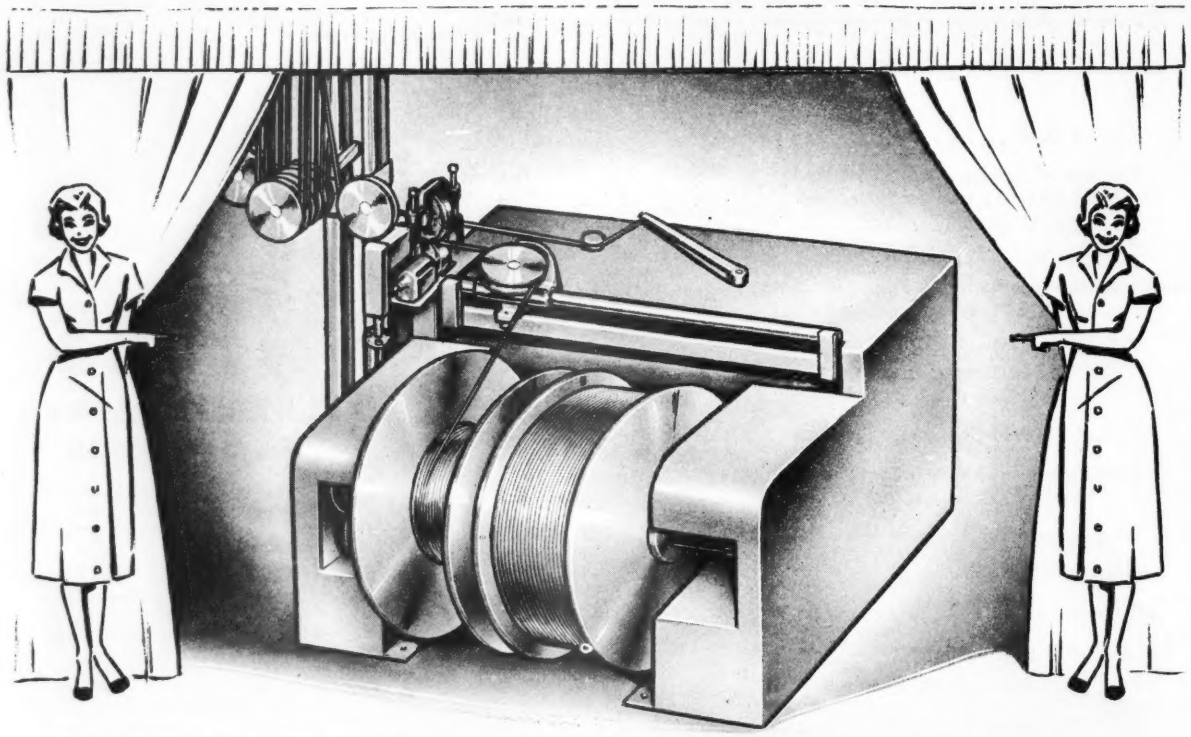

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A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 26 MARCH, 1951 No. 3

The Use of Tungsten Carbide Dies in Wire Drawing and Nail Making

By Edward C. Kinyon, Superintendent
Wire & Wire Products, Columbia Steel Company
San Francisco, California

The author traces the history of drawing dies in this article pointing out the advances made and their import on wire drawing processes. In both materials and in design much is being learned about carbide dies every year; while these tools of industry are reasonably good now there remains no doubt that for some time to come engineers will be developing dies to a high state of perfection.

The wire drawing die, as it is known today, is certainly the most important tool used in wire manufacture. As will be explained in this paper, the development of this tool over the last two decades has resulted in numerous revolutionary changes in the wire manufacturing and wire fabricating industries. Most certainly the use of tungsten carbide nail gripper dies in the nail mill would not be practical were it not for the uniform size and quality of wire that is now being produced using tungsten carbide wire drawing dies.

★ ★ ★

In order to appreciate more fully the tremendous effect on the wire industry of the tungsten carbide wire drawing die, a brief review of its evolution is of interest.

★ ★ ★

The actual date that a die was first used for drawing or shaping wire is not definitely known. However, authorities have attempted, in the absence of many written records, through the discovery of relics and other evidence, to piece together a history of this art.

★ ★ ★

Accordingly, it is believed by many that as far back as 400 A.D. the first wire was produced by being drawn or rounded in a die, as examination of chain armour worn by the knights in the great crusades appears to bear out this belief. The next known reference to wire is contained in an old Latin manuscript written sometime during the 9th century. These writings describe a method of making wire from an alloy of lead and tin, casting it into an ingot, and then hammering it into a long slender bar, following which the metal was drawn through holes in a wire drawing plate. The draw plate is described as a "a piece of iron three or four fingers wide, smaller at the top and bottom, rather thin, and pierced with three or four rows of holes through which wire may be drawn." This description could very well fit the wire drawing plates known as "wortles" or "English dies" which were in use during the 18th century.

★ ★ ★

The wortle plates consisted of a plate of steel approximately 1½" thick, and of sufficient size so that a large number of properly contoured holes could be punched, through which the wire was drawn. A large number of holes were required because of the rapidity with which they were worn oversize, as an average of but 200 pounds per hole was obtained. The preparation of the holes for use in wire drawing consisted of heating the high carbon plates and punching out the holes with tapered punches. When the holes became worn the plates were reheated and the holes partially closed by peening, following which they were resized with the tapered punches. The bearing was finally put into the die with a hand reamer. All of this work required considerable skill and it was a part of a wire drawer's regular job.

★ ★ ★

The next advance in wire drawing dies was the development of chilled cast iron dies. These dies were primarily used for the production of medium and coarse wire, while the cast steel wortle dies were used for the finer sizes. At this time many wire mills established die rooms and the use of specialized personnel for preparing the dies. This permitted the wire drawer to devote his time exclusively to wire drawing.

The chilled cast iron dies had been in use but a short time when the cast chrome steel dies were developed, and they represented the greatest achievement in dies up until the use of tungsten carbide for this purpose. A maximum production of approximately 600 pounds per die hole was obtained with the cast chrome steel dies, and even then the variance in wire diameter between the starting and finishing end of a coil was double the nominal wire tolerances used today. Furthermore, the speed of drawing was limited to about 700 feet per minute, for most sizes. The finish of the wire was generally poor, when compared with the product of today, as scratches and an out-of-round condition were ever present.

★ ★ ★

Other than the above mentioned development of the wire drawing die, little real advancement had been made in the art of drawing wire since the 18th century. However, in the early 1920's, experimentation began with the use of the continuous wire drawing machine. This was made feasible by improvements in rod mills so that more uniform rods in larger bundles were supplied. However, an improved wire drawing die was needed to make these machines a real success.

★ ★ ★

In all probability, the first attempt to use tungsten carbide for wire drawing purposes took place in 1925. However, the carbide used in the dies was not properly manufactured for this purpose and the experiment was a failure. In 1927, a diamond die merchant, by the name of Morris Simons, assisted a copper company in an experiment to draw copper wire with a tungsten carbide die of improved manufacture. The experiment was successful and Mr. Simons then obtained the United States distributorship for this material, which was produced by the German Krupp Company. In 1928, similar dies were successfully used in the drawing of steel wire and thus the carbide wire drawing die was introduced to the steel industry.

★ ★ ★

Although astounding results were obtained from Mr. Simon's original use of tungsten carbide wire drawing dies, considerable experimentation was conducted with respect to the contour of the die hole and its effect on wire drawing speeds, wire tolerances. wire finishes, wire quality, and the production attainable per die hole. As a result of these experiments. the die took its present shape, consisting of a tungsten carbide nib inserted in a suitable steel casing. The contour of the die hole in the nib consisted of a definite bell, approach angle, bearing, and back relief.

★ ★ ★

The "bell". or mouth of the die is located at the entering side of the die. It consists of a wide flaring of the die hole, its purpose being to guide the coated rods or wire into the die while at the same time permitting the lubricant in the die boxes of the wire drawing machines to be drawn into the die hole.

★ ★ ★

That portion of the die referred to as the "approach angle" is located immediately adjacent to the "bell"; it is in this area that the cross section of the rod or wire is reduced to its desired size. In general, the approach angle will vary from 10° to as much as 30°, depending upon the factors to be referred to later in this article.

★ ★ ★

The "bearing" of the die is located adjacent to the "approach angle" and generally has a slight reverse taper of 1 or 2 degrees. Accordingly, its function is not to reduce the area of the wire, but to maintain the size of the die hole. The length of bearing used in industry today varies from a few percent of the diameter of the wire being drawn, to as much as 100%. Here also, variable wire drawing factors and the type of product being produced have a great deal to do with the length of bearing used.

★ ★ ★

The "back relief" is at the exit of the die hole. It consists of a slight countersink to eliminate the sharp right angle that would otherwise be present at the exit end of the bearing. This prevents the pressures from concentrating at a sharp edge of the die with consequential breaking away of pieces of the nibs; also, failure to use back relief at the exit of the die hole may cause scratching of the wire.

★ ★ ★

The selection of the proper "approach angle", "bearing", and "back relief angle" is determined by the following factors:

1. Analysis of steel being drawn.
2. Condition of rod or wire surface to be drawn.
3. The type of product to be produced with respect to:
   - **a. finish desired on wire**
   - **b. number of drafts to be used to obtain final wire size**
   - **c. desired physical requirements of finished wire**
   - **d. lubrication to be used at die boxes**
   - **e. cleaning and coating practices used prior to drawing**
4. Type of wire drawing equipment to be used for production of wire.
5. Product mix being put through mill. This latter is of importance as theoretically different nib sizes should be used for each small range of sizes and types of wire drawn; however, since this is practical only for a relatively large range of sizes and products, the approach angle, length of bearing, and depth of back relief must be varied from the theoretical so as to use a minimum number of nib sizes. Also, it must be remembered that as a die becomes worn, it is finished to successively larger die openings and since the same quantity of dies of a particular size is not used for each possible successive die opening, a build up of dies at specific die openings inevitably results unless this factor is carefully considered in the selection of the proper nib size, along with the cost of the purchased dies.
6. Other special factors influence the proper contour of the die openings, but they would go beyond the scope of this paper.

★ ★ ★

An analysis of the above factors, which affect the contour of the die opening, clearly explains why no two wire mill experts will agree on die opening contours, even though they are talking about the same size and type of wire to be drawn.

★ ★ ★

The importance of die rooms in a wire mill cannot be overlooked. They should be closely controlled and constantly improved, as they have such a great bearing on the quality of the wire, as well as on costs, volume of production, etc. It is essential that controls be established that will insure that each die, of a particular size and for a specific purpose, be an exact duplicate of every other. Furthermore, care must be taken to insure that angles between the bell, approach, and bearing of the die are blended and polished sufficiently to provide a smooth surface for the steel while being drawn through the die; a high degree of polish is not essential.

★ ★ ★

Previously discussed were the limiting factors which existed in the wire industry prior to the development of the tungsten carbide wire drawing die, namely:

1. Length of wire that could be drawn prior to the dies becoming so badly worn that oversized wire resulted.
2. Excessive variation in wire diameter within a coil.
3. Poor finish of wire.
4. Low maximum drawing speeds.

★ ★ ★

The use of the tungsten carbide wire drawing die has resulted in the following revolutionary developments:

1. The production of up to 200,000 pounds of perfect wire per die hole in contrast with a maximum of 600 pounds of useable wire obtained from chrome steel dies.
2. Although the continuous wire drawing machine was experimentally used in the days of cast iron and steel dies, its general and practical use did not commence until after the development of the carbide wire drawing die. This machine, together with the carbide die, has made possible the production of coils of wire weighing in excess of 1200 pounds, thereby reducing labor costs in wire drawing and in subsequent wire mill operations, such as galvanizing, heat treating, and nail making, to mention only a few. The larger coil sizes have also been a boon to the consumer trade.
3. The finish and tolerance of wire which has been properly drawn through carbide dies is far superior to the scratched and off-gauge wire produced with cast iron and steel dies. In fact, special wire can now be commercially drawn to a tolerance of but a few ten thousandths. The production of spring wire to a tolerance of .002 of an inch has made possible the use of automatic spring forming machines, to name but one such development. Furthermore, improved wire tolerances and finish led to a wider field for the use of wire.
4. The increased speeds in wire drawing, due to carbide dies and improved lubricants, have increased the productivity per equipment hour while at the same time obtaining lower labor and capital expenditures. In a few special instances, steel wire drawing speeds now exceed 3000 feet per minute, and undoubtedly greater speeds will result when related problems are solved.
5. Wire drawing had always been considered an art, requiring long apprenticeship and a high degree of skill, prior to the use of carbide dies. However, today the wire drawing occupation is generally considered to be in the class of semi-skilled labor, thereby expanding the availability of suitable manpower.

★ ★ ★

Prior to the advent of the tungsten carbide wire drawing die, the nail mill was used as a "dumping" ground for off-grade and rejected wire, the selling price of nails reflecting this condition. However, using present day dies, modern mills no longer have the quantity of rejects and off-grade wire that was formerly obtained, and therefore, in order to keep the nail mills running, a high percentage of the total wire tonnage required must be made from prime wire. This automatically changed the cost picture in the nail mills and made it imperative that methods and tools be investigated and improved so that lower operating costs could be obtained. This resulted in an operating superintendent discussing with a prominent manufacturer the possibilities of using tungsten carbide inserts in the nail gripper dies.

★ ★ ★

After considerable experimentation and much work, the present day tungsten carbide gripper die was developed. However, the profitable use of this die made it necessary to consider the nail mill in a new light.

★ ★ ★

Up until the development of the tungsten carbide nail gripper die, the nail mill was in a position to use a large portion of the rejected wire from the wire mill, as nail wire. However, the use of the new tungsten carbide nail gripper die limited the use of "rejects" for nail wire, especially with regard to the wire's finish and size tolerance. Should the surface of the wire contain an excess of wire drawing compound or other dirt, the carbide dies will become clogged and will fail to properly grip the wire, this resulting in short nails. Chipped dies frequently develop from this build up of dirt because of resulting abnormal and unequal pressures. Another cause of chipped dies and short nails is the use of wire that has a diameter that is greater or lesser than the standard established nail wire tolerances. Oversized wire creates excessive localized pressures on the edges and corners of the dies, while undersized wire permits the two halves of the dies to forcefully come together, with the result that the carbide inserts become chipped. Undersized wire also causes short nails because the pressure of the die on the wire is inadequate to prevent the wire from slipping while the head of the nail is being formed.

★ ★ ★

For the above reasons it has been concluded that wire, which has been rejected because of improper finish and diameter tolerances, cannot profitably be disposed of in the nail mill when carbide gripper dies are used. Accordingly, it was decided that the solution for the disposal of off-grade wire, was not to produce it in the first place. This type of thinking proved to be quite successful at most aggressive plants, be-

(*Please turn to page* 260)

WHAT IS A WIRE MILL'S IDEA of HEAVEN?

A WIRE MILL'S idea of Heaven is, of course, a place where there are no acid fumes . . . where there is no waste acid to dispose of . . . where there is no pickling bottleneck.

But, just to prove that it isn't necessary to die to go to Heaven, there's MAGICOAT*!

MAGICOAT* has been called "the most important development in wire drawing in decades," and rightly so.

MAGICOAT* is the new OXIDE COATING for drawing patented high carbon steels, annealed low carbon steels, stainless and other alloy steels—*without any acid cleaning whatsoever.*

Many thousands of tons of precious steel will be saved with MAGICOAT*, because there is no loss of metal through pickling.

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DIP IT... and DRAW IT!

*Patent Pending

A Magnus Specialized PRODUCT

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MAGNUS CHEMICAL CO., INC.

SOUTH AVENUE • GARWOOD, N. J.

The Heat Treatment of Narrow Steel Strip by the Electric Direct Resistance Method

By O. C. Trautman, President
The Trauwood Engineering Company
Cleveland, Ohio

This article describes the Electric Direct Resistance Method of heat treating narrow strip and has been in use for the past two years and this new process produces strip which has higher physical properties than that which can be obtained by heat treating in an ordinary furnace operation.

While the Direct Resistance Method for the heat treatment of Steel Wire has been in use in this country and also in foreign countries for a number of years it is only during the past two years that this method has been successfully employed for the heat treatment of narrow steel strip. With the new electric direct resistance process much higher physical properties are being obtained in the heat treated strip than that which is obtained by treating the strip by conventional methods, that is, furnace heating.

★ ★ ★

A complete unit for the electric direct heating of steel strip is shown in Fig. 1 and has a capacity to heat treat 6000 lbs. of strip per hour. This installation is of the continuous or strand type in which strip is fed from reels into the heat treating unit through a looping arrangement thereby permitting enough of a time interval for the joining of other coils of strip by butt welding the ends of the coils together before the strip enters the machine. Upon its entrance to the machine the strip is preheated to a temperature of 800° F and then immediately heated to 1600° F by the passage of an electric current through the strip. This heating is done in an insulated housing which is provided with an atmosphere for the protection of the strip while it is being heated.

★ ★ ★

Immediately upon reaching the desired temperature the strip is quenched in a molten metal bath operating at a temperature of 900° F. In this process the strip is quenched on a rising temperature at the very moment the maximum temperature is reached; there is no time interval from the moment of attaining maximum temperature in the strip and the quench. In furnace heating where the material being heated must travel some distance before it enters the quench, there is a time delay in quenching and also a lowering of the strip temperature especially on the outer surfaces.

★ ★ ★

In the Direct Resistance Method of heat treatment the heating is uniform throughout the cross section of the strip and the time required for bringing the strip to the quenching temperature is relatively short. This rapid heating rate which is many times faster than furnace heating produces a product of fine grain size. The heating rate is controllable and can be varied over a wide range in order to produce variations in structure and grain size.

★ ★ ★

A heating rate of approximately 125° per second is normally employed; however this heating rate may be increased to 500° F per second, if desired. Grain size is dependent on temperature and the rate of heating; a rapid rate of heating yields a product with a finer grain. A fine grained product therefore is tougher because it has more slip planes between the individual crystals.

★ ★ ★

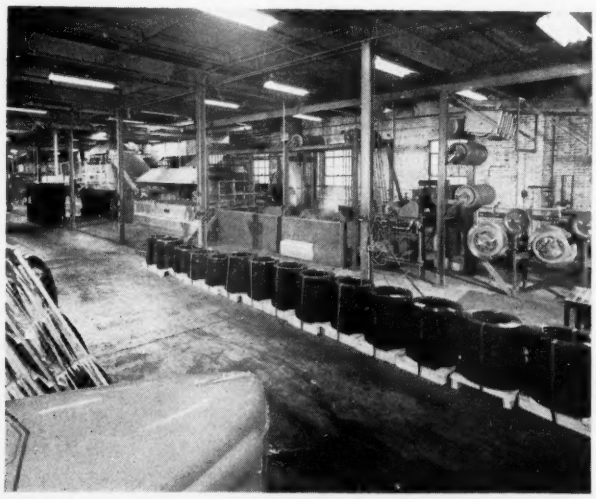


Fig. 1 — Complete Unit for the Electric Direct Heating of Steel Strip

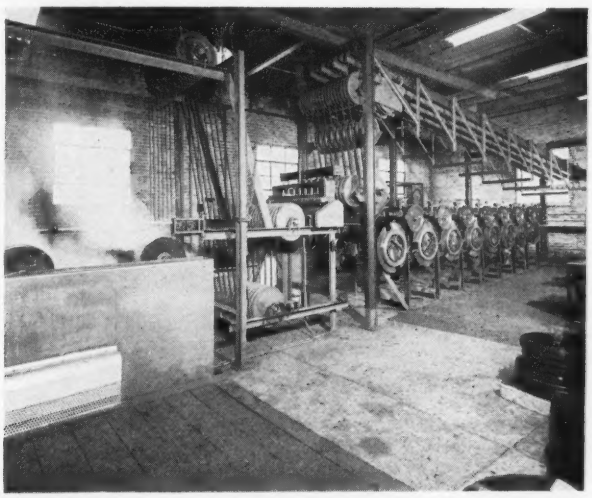


Fig. 2 — Method of Arrangement of the Take-up Reels * * * *

Strip treated by the Electric Direct Resistance Method has proven much stronger than strip heat treated by conventional methods.

★ ★ ★

The strip, after leaving the quenching bath is partially cooled in air or to a temperature of approximately 150° F, and from here the strip enters a liquid bath containing a rust proofing solution which imparts a rust preventive coating on the strip. At the exit end of this liquid bath the strip passes through a wiping device where the excess rust preventive liquid is removed before passing on to the takeup reels. Before the strip goes on to the takeup reels it passes through a second looping arrangement in order to permit a time interval for stopping the individual takeup reels and to remove the coils from the reels.

★ ★ ★

Fig. 2 shows the method of arrangement of the takeup reels. The heat treatment given any individual analysis of steel can be varied at will; the machine being so designed that it can be used for annealing, hardening and tempering, or patenting.

★ ★ ★

Fig. 3 shows a close-up view of the resistance heating section of the machine and the insulated housing in which the strip is electrically heated by its own resistance.

★ ★ ★

In its operation the electric direct resistance heat treating unit is entirely automatic and the only labor required is that which is needed for the handling of the strip at the entrance end of the machine where the payoff reels are located and at the other end of the machine where the takeup reels are located.

★ ★ ★

All temperature control is automatic and a record is kept of the temperature readings together with the voltage applied to the strip. It is therefore possible to duplicate the exact heating conditions for any type of steel or heat treatment required from day to day or as required. Since the strip is heated by the passage of an electric current through it and by its own resistance, maintenance on brick work such as is required in furnace heating is eliminated because there are no high temperature combustion chambers nor is there any brick work or refractory material which is subjected to high temperatures or flame action. This becomes more apparent when, for instance, the resistance method is used for the heat treatment of stainless or other austenetic steels in which temperatures in the order of 2100 to 2200° F are employed. To attain this high temperature or any temperature desired it is only necessary to increase the voltage applied to the machine.

★ ★ ★

This is done by turning a dial on the control panel and the temperature to which the strip is to be heated will be reached in a few seconds time. The temperature of the strip is then held to very close limits by means of automatic constant voltage control.

★ ★ ★

In the case of furnace heating of strip a number of hours would be required to heat the furnace to the required temperature before the heat treating operation could begin. In heat treating operations which require a variation in temperatures for the heat treatment, changes in temperatures can be easily obtained in the work being treated in just a few seconds time.

★ ★ ★

In the quench bath, uniform temperature distribution throughout the bath is insured because the molten metal is circulated in a counter clockwise direction to the direction of travel of the strip; this circulation of the molten metal insures a uniform quenching condition due to the fact that there is no appreciable difference in temperature throughout the entire quenching bath. Due to the continuous circulation of the molten metal the temperature at the point where the hot strip enters the bath can be kept uniform thereby insuring uniform quenching. In the conventional heat treating process of strip or wire in which the strip or wire is furnace heated and quenched in a molten metal bath in which the metal is not circulated, the temperature at the point of quenching tends to rise and is not uniform throughout the bath and the temperature at the quenching

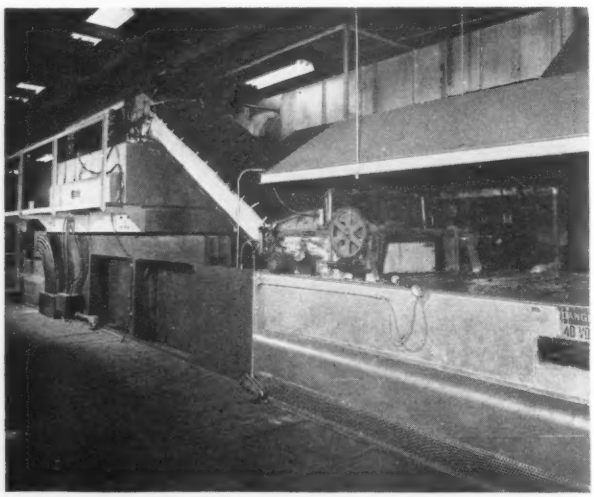


Fig. 3 — Close Up View of the Resistance Heating Section of the Machines

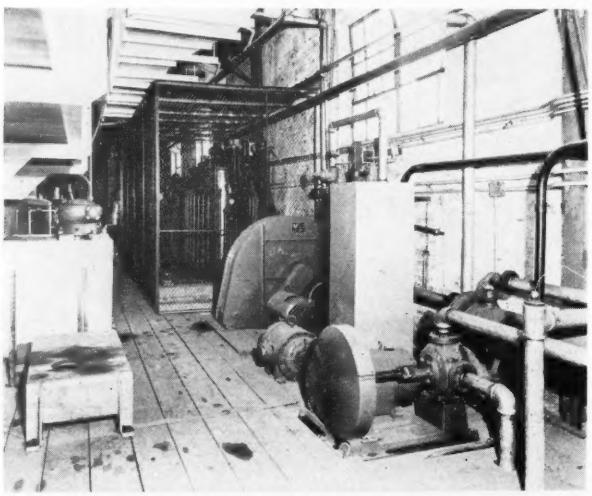


Fig. 4 — Transformer — Blower — Oil Pumps for Machine Shown in Figure 1

point will be as much as 200 to 350° F hotter than the temperature at the exit or other parts of the metal bath. This results in a non-uniformly quenched product with resultant variations in physical properties. This temperature will also vary from time to time depending upon the amount of material being quenched and obviously results in a non-uniform product.

★ ★ ★

In the case of electric direct resistance heating where the metal is circulated in the quench bath, the temperatures at the quenching point and the exit end of the bath will practically be the same, therefore insuring a uniformly heat treated product.

★ ★ ★

Fig. 4 shows the pumps for circulating the molten metal and the oil which is required when hardening and tempering and also shows the transformers which supply low voltage power to the machine.

★ ★ ★

Summary

1. Strip heat treated by the Direct Electric Resistance process possesses higher physical and fatigue properties than strip heat treated by conventional methods.

★ ★ ★

2. High temperatures such as required for the heat treatment of Stainless and other Austenetic Steels are easily obtained, because the strip acts as its own heating element and no combustion or heating chambers are required.

★ ★ ★

3. A much faster rate of heating is possible than with furnace heating.

★ ★ ★

4. The fast rate of heating produces a product having a fine grain resulting in higher physical properties.

★ ★ ★

5. A uniform product is obtained because the material is evenly heated throughout its entire cross section and quenching is done on a rising temperature instead of on a temperature that is falling as in conventional furnace heating.

★ ★ ★

6. Quenching is done at the instant of the attainment of maximum temperature without the loss of time interval that occurs when furnace heating and quenching.

'WAY DOWN SOUTH IN DIXIE will be held the

SOUTHERN REGIONAL MEETING

of the

WIRE ASSOCIATION

May 17 and 18, 1951, at the Henry Grady Hotel, Atlanta, Georgia. In the afternoon, Thursday, there will be technical papers by John Middleton, Metallurgist, Republic Steel, and K. P. Campbell, Metallurgist, Sheffield Steel. W. L. Dull, Supt., Wire Mills, Sheffield Steel, will serve as chairman. The spring meeting of the Board of Directors will preceed the technical session in the A. M. Cocktails will be served before the banquet in the evening through the courtesy of Standard Industrial Compounds Company and R. H. Miller Company. R. S. Lynch, President of Atlantic Steel will address the group following dinner.

On Friday, with C. J. Beneke, manager, Reynolds Metals, as Chairman, J. H. Girdler, Vice Pres., Charge Operations, Atlantic Steel Co., will deliver a paper on mill safety. In the afternoon there will be a plant inspection trip to the Atlantic Steel plant, followed by a barbacue as guests of the Atlantic Steel Company.

A fee of $6.00 will be charged to cover the banquet and busses.

COME TO THIS IMPORTANT SESSION. MAKE YOUR PLANS NOW TO ATTEND.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

Knitted Coverings for Wire and Cable

Part 2—The Economics of Knitting

By H. I. Greene, Vice-President
Fidelity Machine Company, Inc.
Philadelphia, Pa.

This is PART II of Mr. Greene's article. Part I appeared in the February, 1951 issue of WIRE AND WIRE PRODUCTS.

1. Introduction

The Knitting method is adapted to the manufacture of weatherproof wire and cable at high speeds. Many mills are experiencing savings in yarn labor, maintenance and power and floor space besides improving working conditions under which these products are produced. By this method wire or cable can be given these knitted coverings at the unbelievably high speed of 1800 feet an hour.

★ ★ ★

2. Principle Behind Knitting Method

Two accepted methods of covering are considered here—braiding and knitting. Basically, braiding machines are limited in speed because of the operational principle of crossing carriers. The size of the yarn package is also limited because centrifugal force imposes severe wear on the various parts. Where the supply packages must be rotated about the product to be covered, heavy machine elements are necessary to resist the substantial forces which are developed. As manufacturers of both braiding and knitting equipment, our company has been able to appraise both types impersonally.

★ ★ ★

Wire manufacturers using maypole type braiding machines through limitation of package and design, can at best operate at a speed of two to three feet per minute. (Even specially designed high speed braiders cannot operate faster than five or six feet per minute). The knitting principle of covering wire by using stationary packages and revolving a small diameter knitting head jumps the practical size of the package to one limited only by winding machine capacity. The package remains stationary at all times and the design of the knitting head permits the astounding increase in speed to approximately 30 feet per minute, or a multiplication of production ten to fifteen times that of the maypole type braider.

★ ★ ★

3. Yarn Cost

The two to five pound cone type yarn packages used on the knitter are the standard size known to the textile industry and are used as commercially produced. Braiding machines, however, require these packages to be rewound on a backwinder onto bobbins only a few ounces in size.

★ ★ ★

One major wire manufacturer has found there is a saving of $.04 per pound when yarn is purchased in the large cone type packages used on the knitter rather than in the small bobbins used on a braider.

★ ★ ★

Good braiding practice demands the use of more expensive two-ply cotton yarn on the outer braid of weatherproof wire and cable.

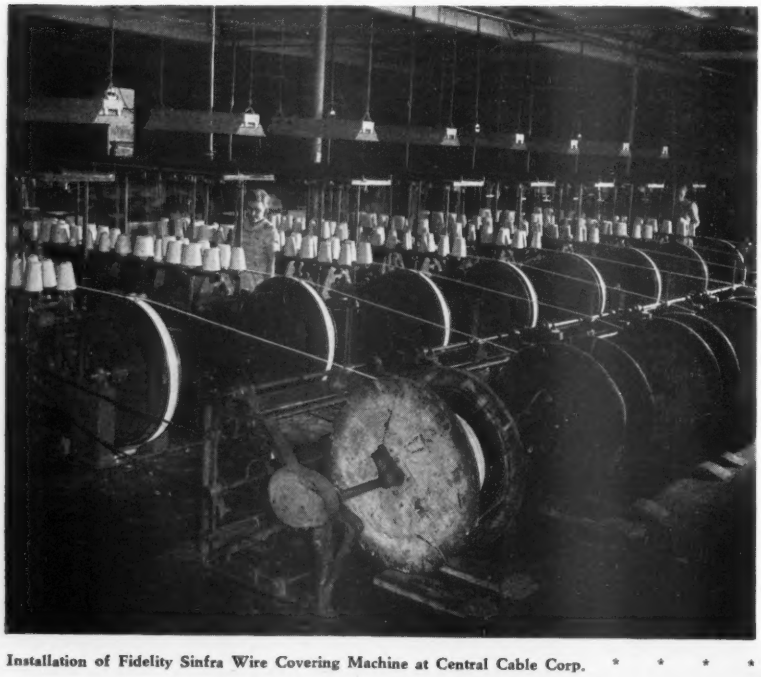
★ ★ ★

The knit product complies in all respects, however, when knit with single ply cotton yarns. Single ply yarns are less costly than the two ply and one major wire company states they are able to save $.10 a pound in purchasing single ply knitter yarn rather than two ply braider yarn.

★ ★ ★

The American Standards Association specifications limit the total weight of the three covers to not less than 30% and not more than 40% of the total insulation on the weatherproof wire, and specify the total weight of insulation for each size wire.

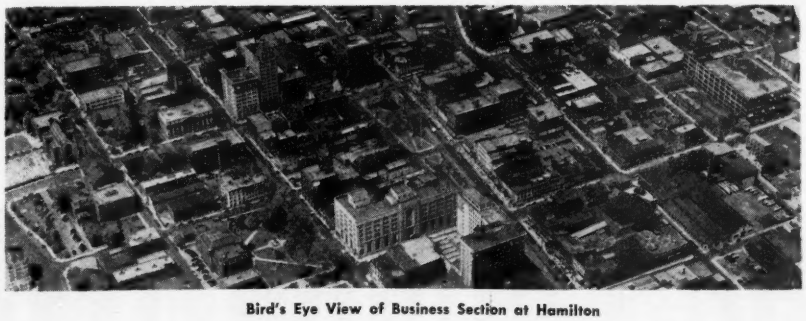
(*Please turn to page* 245)



Installation of Fidelity Sinfra Wire Covering Machine at Central Cable Corp. * * * *

You Are Cordially Invited to Attend the
CANADIAN REGIONAL MEETING of the WIRE ASSOCIATION

THURSDAY and FRIDAY, APRIL 19 and 20, 1951, at HAMILTON, CANADA.
HEADQUARTERS: ROYAL CONNAUGHT HOTEL



Bird's Eye View of Business Section at Hamilton

An interesting and varied program has been arranged by the CANADIAN REGIONAL MEETING COMMITTEE, of which James W. Galloway, B. Greening Wire Co., Ltd., is chairman. You will want to attend this important session. Program details below.

PROGRAM ARRANGEMENTS

Thursday, April 19th

9:00 A.M.—Registration on Mezzanine Floor, Royal Connaught Hotel.

2:00 P.M.—Plant visit at B. Greening Wire Co., Ltd., Hamilton. Busses will leave the Hotel at 2 P.M. promptly.

6:30 P.M.—Cocktail Hour in the Crystal Ballroom of the Royal Connaught Hotel.

7:00 P.M.—Association Banquet in the Crystal Ballroom of the Hotel. The speaker will be Dr. H. G. Thode, M.B.E., P.H.D., F.R.C.S., Principal of Hamilton College, MacMaster University.

Friday, April 20th, ***Technical Sessions***

9:30 A.M.—First Paper—"History of Insulated Wire and Cable in Canada", presented by H. G. Watts, Canadian General Electric Co., Ltd.
Second Paper—"Nylon Field Wire Development", presented by C. A. Litzler, Industrial Ovens, Inc., Cleveland, Ohio.

2:00 P.M.—"Panel Discussion on Electric Drives in Wire Mills". Discussion Leader: C. G. Easter, Superintendent, Canada Works, Steel Company of Canada. Panel Members: R. A. Duke, Applications Engineer, Canadian Westinghouse Co., Ltd., Richard Guter, Chf. Applications Engineer, Reliance Electric & Engineering (Canada), Ltd., and D. McCready, Electrical Superintendent, Steel Company of Canada, Ltd.
Second Paper: "Wire for Fasteners", presented by S. W. McDermott, Works Manager Swansea Works, Steel Company of Canada, Ltd.

The registration fee will be $8.00, which includes transportation to the plant on the 19th, admission to the technical sessions, the Cocktail Hour and the Association Banquet. The dinner alone will cost $5.00.

LADIES' ACTIVITIES: Ladies are invited to the Cocktail Hour and the Banquet on Thursday. Luncheon is being arranged at the Tamahak Club on Friday. Full information will be available at the Registration Desk. Besides this, the many fine shops and stores in Hamilton will be found of interest to them.

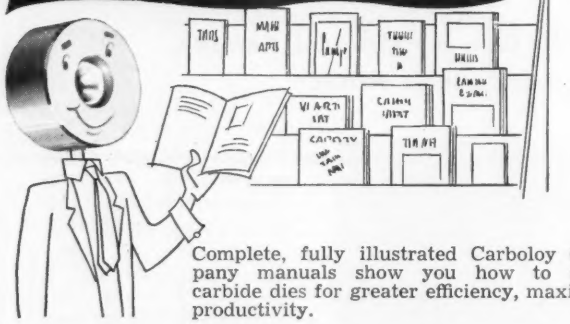
THIS MEETING WILL BE ONE YOU WILL NOT WANT TO MISS. WIRE ASSOCIATION MEMBERS WILL RECEIVE HOTEL RESERVATION CARDS IN THE MAIL. ALL OTHER WIRE MEN DESIRING TO ATTEND WILL PLEASE ADDRESS:

THE WIRE ASSOCIATION

Richard E. Brown, *Executive Secretary*

300 MAIN STREET **STAMFORD, CONN.**

TECHNICAL LITERATURE



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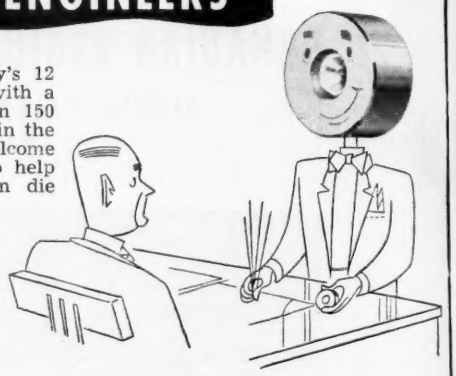

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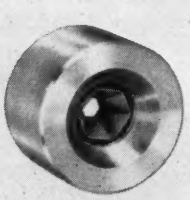
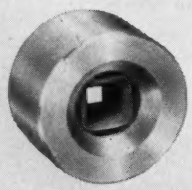
Put these time-tested Carboloy services and dies to work for you now by sending the coupon for further information.



Carboloy hex die

Carboloy special shape dies



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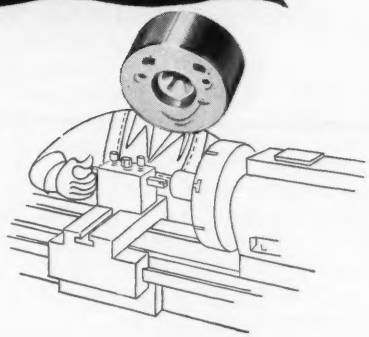

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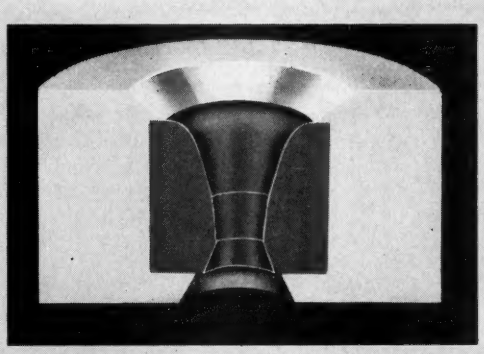
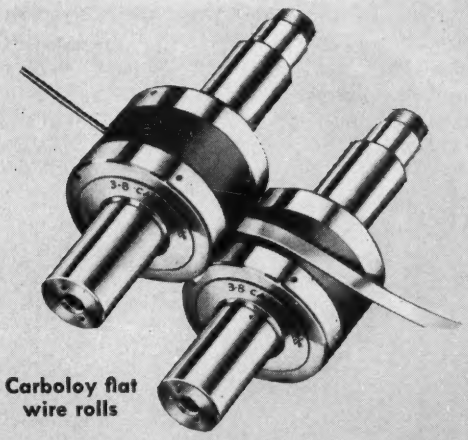
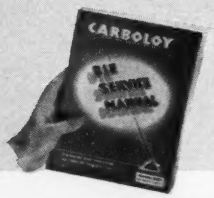


Note built-in back relief in Carboloy rough-cored dies



Carboloy flat wire rolls



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C. F. & I.'s Mid-Century Expansion

Into the chapters of 1950, CF&I has written a tale of new equipment, modernization and expansion that has brought recognition to the Pueblo steelmills as one of the nation's leading producers of wire and wire products.

★ ★ ★

Seeking to diversify products of the Pueblo plant, the management has concentrated on ever-increasing production of wire during the past year. New galvanizing installations, new patenting furnaces, stranding machines, welded-wire fabric machines and revolutionary methods of handling and storing wire products have been put into operation at the Pueblo wire mill.

★ ★ ★

From the expanded wire mill have come new products carrying the CF&I label. Products such as high carbon spring wire, stranded "guy" wire, stucco netting and other items that will weave steel threads into the industrial tapestry of the west.

★ ★ ★

Galvanized wire, the shiny thread of steel that encloses western farm and rangelands, is flowing from CF&I's pioneer western steelworks in increased quantities following installation of new galvanizing equipment.

★ ★ ★

Field fence, V-mesh, ornamental fence, chain-link fence, welded wire fabric, staples, barbed wire, cinch fence stays and market wire are all end-products of the new galvanizing process at Pueblo.

★ ★ ★

Expanded operations in the wire mill required increased floor space; an addition was constructed adjoining the welded wire fabric building. Two new welded wire fabric machines have been installed in this structure to handle increased output of this product.

★ ★ ★

To handle increased wire production, warehouses of CF&I have been equipped with palletizing equipment. Fork trucks, sleds and pallet transporters now handle the rolls of wire with great ease and facility, and every square foot of warehouse space, from floor to ceiling, is put to use.

★ ★ ★

Keeping pace with increased production in the finishing mills, CF&I has also stepped up power output and central heat treating facilities during the mid-century modernization program at the Pueblo steelworks.

★ ★ ★

The new central heat-treating plant coordinates heat-treating operations that were previously carried on in the smith shop, the wire mill, bolt mill and other plant divisions. Shear knives, ball headers, lathe tools and dies of various descriptions are treated in the new shop. The shop is equipped with gas-fired and electric furnaces.

★ ★ ★

Installation of air heaters at the power house boilers was also a part of the Pueblo expansion program. The new heaters expanded steam generating capacity. Installation of the air heaters required erection of seven new 89-foot smoke stacks, which stand as towering symbols of CF&I's progress.

★ ★ ★

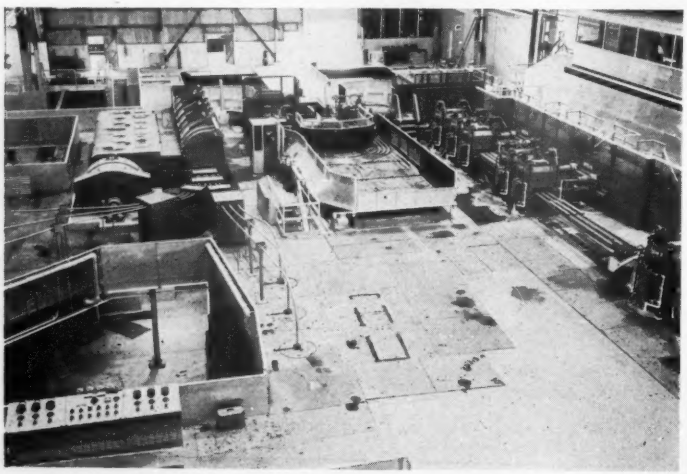
Expansion of Pueblo's wire mill facilities is a direct result of the 1949 installation of a new Morgan rod mill. Increased production of rod has made it possible to provide more wire for the west's needs.

★ ★ ★

Comfort of workmen also has been kept uppermost in the minds of CF&I's planners during the past year. Open hearth workmen today are using their newly completed change station which provides wash-up and toilet facilities for more than 1,000 men in this largest of Pueblo's steelmill departments. Erected at a cost of more than $200,000, the new change station boasts ample locker space for open hearth men who previously have enjoyed only limited clean-up facilities.

★ ★ ★

Mid-Century progress at the Pueblo plant has laid the basic groundwork for continued expansion of the west's largest steelmills. During this year a further $26 million will be expended for increased open hearth, blast furnace and finishing mill facilities.



Part of the new Morgan continuous rod mill at Pueblo * * * * * *

ANOTHER IMPORTANT MEMBER OF WATERBURY-FARREL'S LINE OF WIRE-WORKING MACHINERY

HOW THIS WATERBURY-FARREL WINDER puts trolley wire in its place

This new Waterbury-Farrel Trolley Wire Winder has an automatic, hydraulic, spool-traversing feature that assures a very accurate lay of wire.

The wire moves straight ahead while the spool itself traverses. It moves across the path of the wire at exactly the right pace to put the wire precisely where it belongs on the spool. A special slip friction device compensates for the build-up of the spool.

This machine can be furnished to take spools up to 56" O.D., 31" barrel with a 26" traverse. It has a maximum capacity of 7,500 lbs. of wire plus approximately 1,800 lbs. for the spool . . . a total load of 9,300 lbs.

Further information on this machine or on any of the equipment indicated below is available on request.

WATERBURY FARREL FOUNDRY & MACHINE COMPANY
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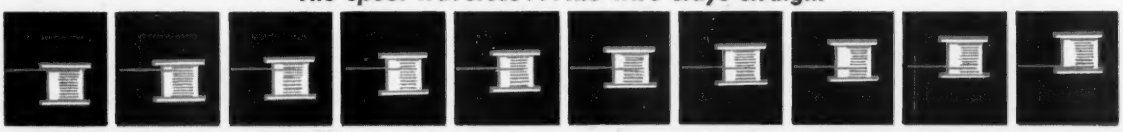
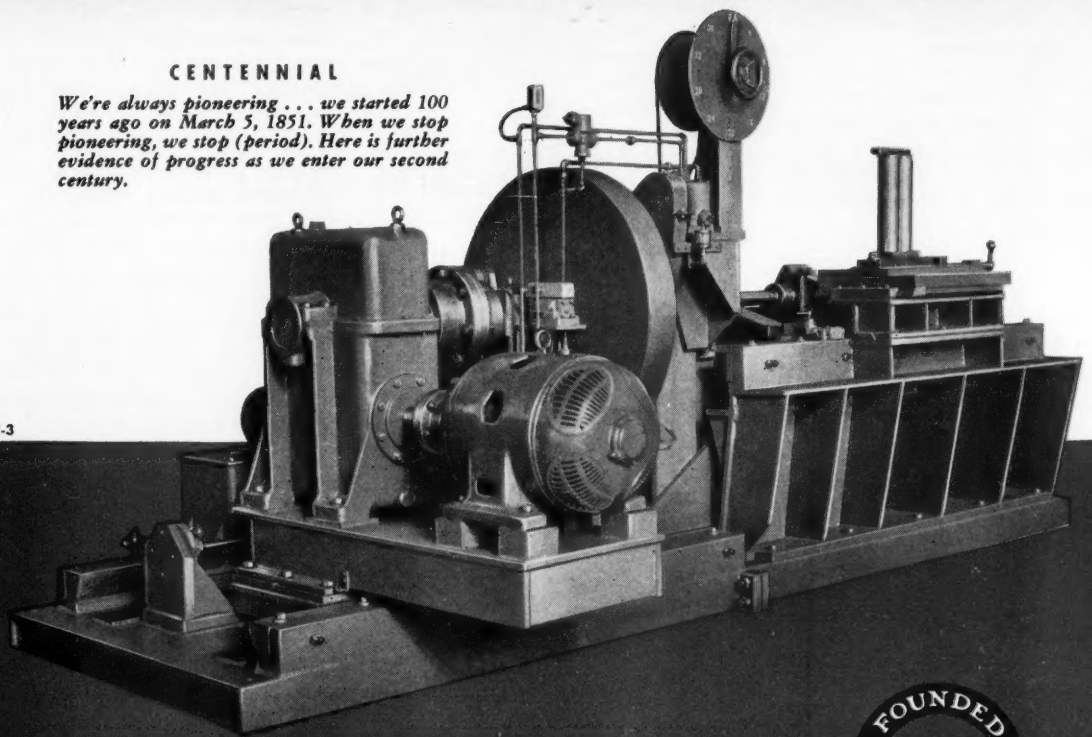
Sales Offices: Chicago, Cleveland and Newark

The spool traverses . . . the wire stays straight



CENTENNIAL

We're always pioneering . . . we started 100 years ago on March 5, 1851. When we stop pioneering, we stop (period). Here is further evidence of progress as we enter our second century.



WF-3

A FEW OF THE MANY TYPES OF METAL WORKING MACHINERY MADE BY WATERBURY FARREL

WIRE MILL EQUIPMENT—Continuous Fine Wire Drawing Machines • including Upright Cone and Tandem types • Bull Blocks • String-up Machines • Spoolers, Etc. • *COLD PROCESS BOLT AND NUT MACHINERY*—Headers (all types) • Re-headers • Trimmers • Thread Rolling Machines • Slotters • Nut Tappers, etc. • *POWER PRESSES* — Crank • Cam and Toggle; also Rack and Pinion Presses • Transfer Presses • Multiple Plunger Presses • Hydraulic Presses, etc. • *MILL MACHINERY* —Rolling Mills • Wire Flattening Mills • Chain Draw Benches • also Slitters • Straighteners • Pointers Swagers • Cut-off Saws • Coilers • Winders, etc.

FOUNDED WATERBURY FARREL 1851

In Equipment, Experience Counts . . . We're 100 in '51!

Stresses in Small Wire Ropes

By Henry M. Hall
Pioneer Steel Ball, Inc.
Unionville, Conn.

The user of small wire ropes and cords, such as aircraft and similar control cables, often has occasion to calculate the required breaking strength of his cables. For this reason the following analysis of the theory of stresses in the wires and strands of a wire rope will be of interest.

★ ★ ★

In Fig. 1, AB represents a short length of one strand of a rope, or one wire of a strand. T is the angle made by the strand or wire with the axis of the rope or strand. In other words, T is the angle of lay. The lay is generally expressed as the distance along the axis of the rope or strand in which the strand or wire makes one complete turn, thus corresponding to the pitch of a screw thread. A simple relation connects this angle of lay, T, with the length of lay, or pitch, L:

$$T = \tan^{-1} \frac{n D}{L}$$

where D diameter of the circle described by the center of the strand as it moves around the rope axis while forming one lay, or pitch, L.

★ ★ ★

In the diagram P represents the load or pull on the rope, along its axis, and S is the component along the strand axis. The following nomenclature will be used in our discussion:

P = load on rope, parallel to its axis.

P′ = load on each strand, parallel to rope axis.

T = lay angle of rope (strands in rope).

S = load on each outer strand, parallel to its axis.

p′ = load on each wire, parallel to strand axis.

s = load on each wire, parallel to wire axis.

t = lay angle of strand (wires in strand).

N = number of strands in the rope.

n = number of wires in a strand.

Assuming equal distribution over the strands of the load on the rope,

(1) $P' = \frac{P}{N}$

Then

(2) $S = \sec T P' = \sec T$ - - -

For the center strand, its axial load $= \frac{P}{N}$

★ ★ ★

Therefore the total axial load on all the strands, since there are (N-1) outer strands,

(3) $= [(N-1)\sec T + 1] \frac{P}{N}$

(4) $p' = \frac{S}{n}$ (assuming equal distribution over the wires)

(5) $s = \sec t p' = \sec t \frac{S}{n}$

(6) $= \frac{\sec T \sec t}{n N} P$ for each wire in the (N-1) outer strands.

(7) $= \sec t \frac{P}{n N}$ for each wire in the core strand.

★ ★ ★

In the above discussion the following assumptions have been made. All rope loads are equally distributed amongst the several strands, and all strand loads are equally distributed over the individual wires. This applies to all loads, whether parallel to rope, strand, or wire axes, and is tied in with the following additional assumption, that all strands and wires are free from friction and binding, one against the other. A third assumption, which is very important practically, is that all strands and wires are in full and complete contact with each other, that they are firmly compacted together, and that there is no looseness or "sponginess" in the rope structure. This means that there is no stretch, under load, due to the component parts bedding more tightly together. In other words, all

(*Please turn to page* 257)

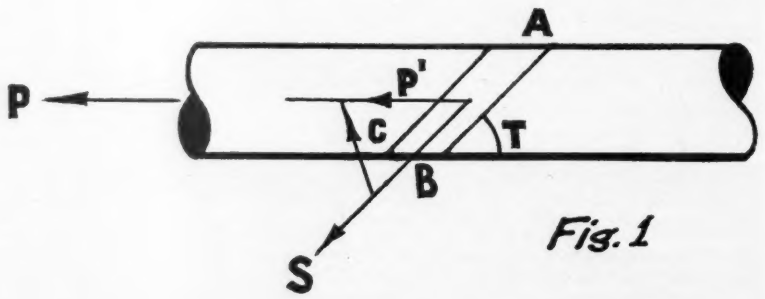


Fig. 1

The bundle of sticks

A wise old man called his quarrelsome sons about him. Taking up a bundle of sticks, he commanded each in turn to break the sticks. All tried, but in vain, and said it could not be done.

"And yet, my boys, nothing is easier to do," said the father, as he undid the bundle and broke the sticks, one by one. "By this example, you can see that united you will be more than a match for your enemies; but if you quarrel and separate, your weakness will put you at the mercy of those who attack you."

The useful truth of this fable is just as timely today as it was when the Greek ex-slave Aesop told it 2,500 years ago. You, a patriot, believing in individual liberty and freedom for all, see our American way of life threatened by the menace of communism abroad and jeopardized at home by complacence, negligence, confusion and incompetence.

As a business leader in your own community, you have a particular responsibility to help unify your fellow citizens and guide their thinking and action--for the strengthening and preservation of the ideals that built America, in fact, made America the envy and goal of the very individuals now seeking to destroy it. *In Union there is Strength.*

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GOSSIP from BRITAIN

Nothing has broken from the news angle regarding the Government attitude towards the Wire Association in this country now that it has an active interest in wire production. However, a lead was given recently by **Lieut. Commander Goeffrey K. Rylands** of Messrs. Rylands Bros. Ltd., one of the biggest wiredrawers in Britain, and staunch stalwart of the association, and nationalised as part of The Lancashire Steel Corporation, who said that the arrangement was to carry on as usual.

★ ★ ★

The British Diamond Die Manufacturers Association have moved to Dickens House, Tooks Court, London, E.C.4. wherein lived the famous author and wrote many of his books. The Association was formed just after the war with a 100% membership. A great influx to the ranks of diamond die makers produce quantities that cannot be absorbed by home markets; hence, overseas outlets are imperative. The best dies are going abroad and home users who keep records are complaining that those sold for home consumption give poor service compared with pre-war dies. To complicate matters, the Association, in consultation with the Board of Trade (the government department controlling imports and exports), have permitted large exports of industrial diamonds, thus shortening supplies still further. It seems incredible, but because of this, gem stones are being used.

★ ★ ★

Mr. W. F. Kerley, the well-known writer on drawing die matters, whose articles have appeared in "Wire and Wire Products," has been "nationalised", the firm he serves having been taken over. A little ruefully he mentioned that perhaps because of this, he had little to do now with producing dies, but was engaged in the production of watch springs. They hope to oust swiss springs which for many, many years have dominated the world markets.

★ ★ ★

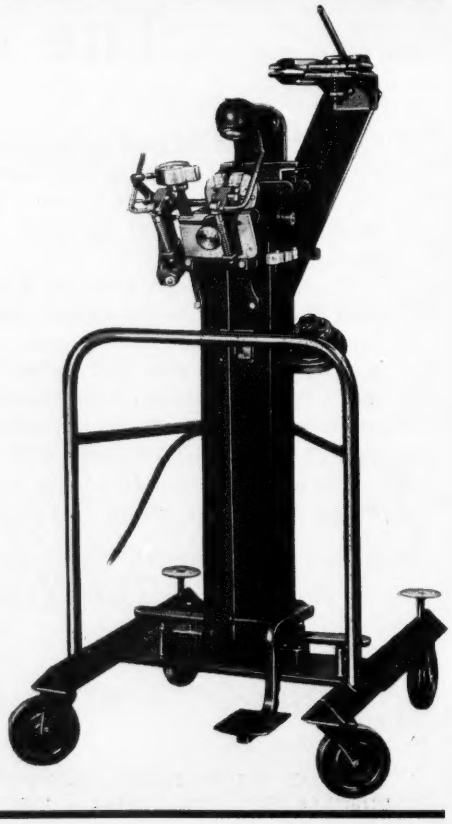
Mr. Peter Smith, the director of Frederick Smith & Co. Wire Manufacturers, Ltd., of Halifax, has a good programme in hand for the Staff School run under his aegis by the firm. This school in wire, started a couple of years ago, marked the beginning of a new era in British wire circles. Up to then, wire drawing technique was a closed shop, each concern going to extraordinary lengths to keep its "secrets" from competitors. Under this system, only the few who travelled abroad kept abreast of modern methods. Smith's invites all and sun-

MICROMETER PRECISION — MICRO-WELD TRADE MARK REGISTERED

MODELS J-3-C and J-4-C AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding COPPER, ALUMINUM, and other non-ferrous wire ranging in size from .031" to .128" diameter.

The welding cycle on these welders is automatically controlled and completed by a single downward stroke of the foot pedal, which include the clamping of the wire being welded, contacting the welding switch, and applying the upset pressure on the weld. All units are equipped with annealing dies, filing vise, light, extension cord, and mounted on a 4-wheel truck.



MICRO PRODUCTS CO.,

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Telephone: STATE 2-7468

dry to attend lectures and visit the works and the most knowledgeable members of the trade are being induced to impart their knowledge.

★ ★ ★

A dinner was held recently at the Mansion House, home of The Lord Mayor of London, by the Worshipful Company of Gold and Silver Wiredrawers. This company received its charter on June 16th 1693 and is one of the oldest of the ancient city guilds. Few of the members in these days work at the trade however.

★ ★ ★

Another historic company is that of "The Tinplate Workers alias Wireworkers". Formed first in the thirteenth century as "Mystery of Ironwiredrawers and Cardmakers" it became in 1451 "The Mystery or Company of Pinners and Wireworkers", finally becoming "The Worshipful Company" under the above title in the early 1600's. The group is still active.

★ ★ ★

Re-armament allied with steep price rises of zinc, tin, copper, rubber and cotton, plus shortages caused by national stockpiling, is causing chaos in the wire and cable trade. Reserves are less than half those of a year ago. Makers of non-ferrous wire and wire goods are the ones most badly hit.

★ ★ ★

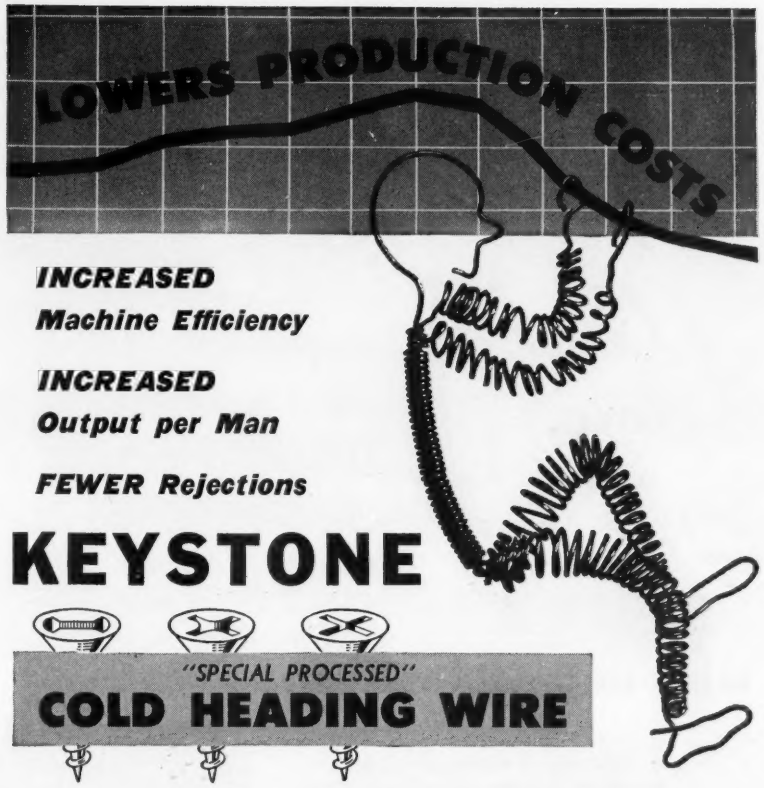
The Government has re-introduced the system of export licenses for all non-ferrous exports of wire and wire goods, whilst manufacture for the home market has been banned. Such a colossal sweep may place businesses in jeopardy and, so far, Government re-armament orders have not materialised in sufficient volume to fill the gap.

★ ★ ★

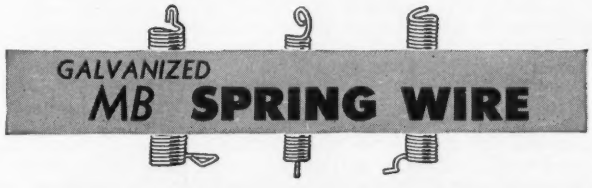
Ferrous wire makers are also experiencing shortages. Galvanizing and tinning materials and goods coated with these materials are likely to disappear from the home market. Aluminum will probably fill the gap, particularly for fencing wire, barbed wire etc. Departments are being closed down in almost every factory.

★ ★ ★

Further groups are to be scrutinized under the Monopolies and Restrictive Practices Commission. Those concerned with brass, phos-



Many manufacturers are gaining increased efficiency in the production of recessed head screws with Keystone's "special processed" cold heading wire. This wire has uniform upsetting and forming qualities. Because of its excellent flow properties, die and plug life are often more than doubled. Production reports show less waste, fewer rejects, reduced inspection time and a higher quality finished product when this superior cold heading wire is used.



Keystone's process of *drawing after galvanizing* smooths and hardens the zinc coating, increasing its lasting qualities and its physical properties. This smooth finish, corrosion resistant Spring Wire is available in Type 2 and Type 3 heavy weight zinc coating as well as the regular weight suitable for most applications.

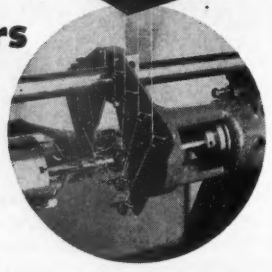
If your product requires "special" steel wire, please consult us.

INCREASE YOUR WEATHERPROOF WIRE PRODUCTION...

10-15 times with Fidelity SINFRA wire and cable knitters

Fidelity Sinfra Knitter and Haul-off Reel Stand

- Less Yarn Cost
- 15 Times Productive Output
- 600% Greater Labor Productivity
- Less Floor Space
- Lower Maintenance
- Lower Power Requirements
- Complete Automatic Control
- Minimum Noise
- Easier Working Conditions
- Accepted by ASA, AAR, UL, CSA
- Lower Capital Investment



Enlarged view of Knitting Head

The production of *one* FIDELITY SINFRA wire covering machine is equivalent to the capacity of 15 triple deck braiders! This impressive production achievement is made possible by the reliable and extremely high speed Fidelity Knitting Head, using stationary, large yarn cones.

The SINFRA Knitter is built to the precision standards long associated with Fidelity and is equipped with automatic electric stop motions, controlling both the wire and yarn supply. As the wire enters the SINFRA Knitter it is straightened by a unique straightening device before being passed through a series of 3 knitting heads.

SINFRA Knit is widely acclaimed as the most modern method of covering wire. Wire covered by SINFRA Knit is accepted by the American Standards Association, Association of American Railroads, Underwriters' Laboratories, Inc. and the Canadian Standards Association.

SINFRA Knitter is designed to permit horizontal operation at normal working level. No longer need your operators crawl or stretch to service wire covering equipment and noise level is reduced to a pleasing hum. Top companies have found their answer to production in SINFRA Knitters. Why not write for complete information on this development to lower your production costs and increase your productive capacity.

Write today for literature on this time and money saver.

Manufacturers of intricate precision machinery since 1911.

FIDELITY MACHINE COMPANY INC.

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phor bronze and copper wire, brass and copper rods, extruded sections and nickel silver wire.

★ ★ ★

The end of Marshall Aid has not improved business for agents of American wire and cable machinery in this country, although orders for the European Continent are still good from those countries still receiving this assistance.

★ ★ ★

Inco Nickel Deliveries in 1950 Highest For Any Peace-Time Year

Deliveries of nickel in all forms in 1950 by **The International Nickel Company of Canada, Limited,** were 256,000,000 lbs., constituting a record for any peace-time year, Dr. John F. Thompson, President, disclosed recently. Deliveries in 1949 were 209,292,257 lbs.

★ ★ ★

The president reports that the company's receipts from sales of nickel, copper, platinum and other products for 1950 amounted to $228,000,000 (in terms of U. S. currency) which compared with $182,806,452 for 1949. Other points mentioned are:

1. The company's current production of nickel is at maximum capacity and is expected to be larger in 1951 than in any peace-time year in its history.

2. Barring unforeseen interruptions, the company will complete in 1953 its program of full conversion from surface to underground mining which has absorbed the major portion of its $100,000,000 in capital expenditures over the past ten years.

3. When this undertaking is completed, the company's underground mining operation will be unmatched in size by that attained by any nonferrous base metal mining operation in the world.

★ ★ ★

The volume of nickel deliveries in 1950 was made possible by increasing production with maximum speed and drawing on the reserve stocks of nickel which had accumulated. The military requirements of Canada, the United States and the United Kingdom are being met and deliveries are being made to government stockpiles. The balance of the supply is being rationed among civilian consumers in all markets throughout the free world.

★ ★ ★

Government Wire Production Information

New Calibration Method For Testing Sieves

A simple, rapid procedure for determination of the effective opening size of testing sieves has been developed by V. R. Deitz and F. G. Carpenter of the National Bureau of Standards. The new method[1], which employs calibrated glass spheres of graduated size, may be readily applied by anyone familiar with sieving procedures without the need of special apparatus. Use of this technique is expected to reduce markedly the discrepancies which now occur between sieve analyses made at different laboratories with different sieving equipment.

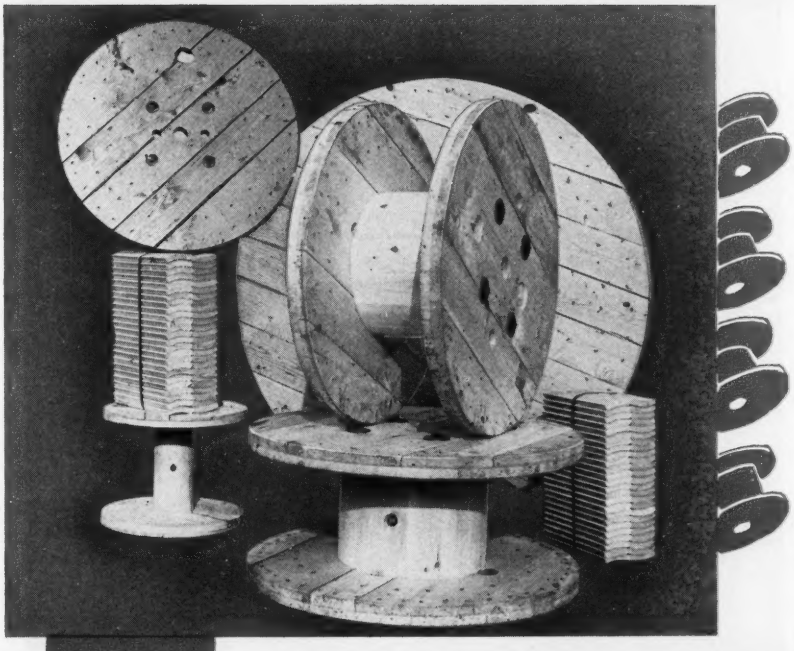
★ ★ ★

While sieve analyses are widely used in the cement, paint, abrasive, sugar, and other industries for measurement of particle size, the discrepancies in the results of different laboratories—such as those of buyer and seller—often result in rejected shipments and financial loss, as well as considerable ill will. These discrepancies are sometimes due to inadequate sampling procedures, but when good representative samples, or even the same sample, are used, the differences frequently remain. Apparently the greatest source of error in sieve analysis has been the evaluation of the size of the openings of the testing sieves used.

★ ★ ★

In sieve analysis, the finely divided or granular material is agitated on a sieve of known opening until substantially all the particles that are small enough to pass the openings have done so. The fineness of the material is expressed by the weights of the various fractions retained by the sieves of different sizes. It has been found that the shaking process can be carried out in a satisfactorily reproducible manner and that the weights of the fractions retained by the sieves can be determined without appreciable error. But measurement of the size of

[1] For further details, see Methods of sieve analysis with particular reference to bone char, by Frank G. Carpenter and Victor R. Deitz, J. Research NBS 45, 328 1950) RP 2143.



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ALL SIZES AND TYPES.
SHIPPING AND SHOP REELS.

WOOD REELS

RETURNABLE AND NON-RETURNABLE

BRIDGE REELS are LOW IN COST, RUGGED in CONSTRUCTION for SEVERE HANDLING, and WELL MADE.

Our trucks will deliver reels to your door if you are within 200 miles of Hazardville. Fast freight service will reach points as far away as St. Louis in three days or Cleveland in two days.

SIZES: FROM 12" to 96" IN DIAMETER

ALSO, REEL HEADS FOR STEEL DRUMS

Our streamlined production methods give you reels of the best possible construction at costs that represent real savings. This, plus our unique distribution system, offers you a dependable, efficient source of supply for your reels.

Reels are furnished knocked down or assembled. Standard sizes in stock, special reels made to your specifications on short notice.

TRY BRIDGE REELS for quality and service.

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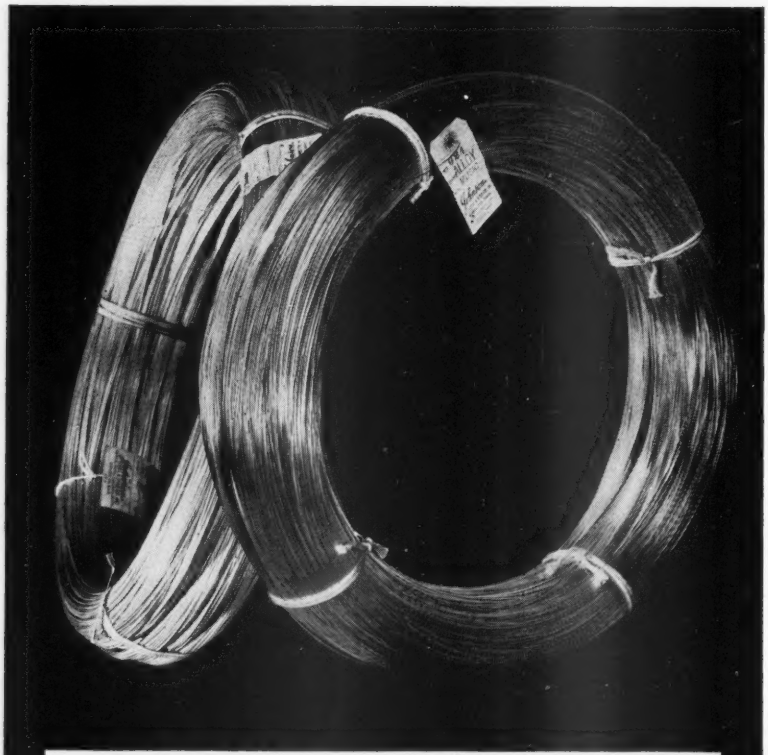
MANUFACTURING CO.
HAZARDVILLE, CONN.
Phone Thompsonville, 4928

Let us quote on your reel needs.



JOHNSON is a wire specialty plant, not a tonnage mill. Every Johnson wire is drawn under close laboratory supervision, resulting in the specific wire for its intended use. Johnson goes in for top quality and ease in processing.

Music Wire—"The wire of a thousand uses" . . . Brush Wire . . . Aircraft Cable Wire . . . Vacuum Hose Wire . . . Hose Reinforcement Wire (braided type) . . . Tire Bead Wire . . . Johnson Stainless Steel (18-8 grade, types 302 and 304) comes to you with lasting harmless lubrication (not to be removed).

JOHNSON
STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.
New York Philadelphia Cleveland Detroit Akron Chicago
Atlanta Houston Tulsa Los Angeles Toronto

the sieve openings has always presented a problem.

★ ★ ★

The method now in use consists in the determination of the size o the average opening from microscopic measurements. This requires equipment and technique which many users of sieves do not possess. Moreover, for nonuniform sieves, the size of the average opening has no significance because the largest openings determine the fineness of the material which the sieve will pass.

★ ★ ★

The method developed at the Bureau, on the other hand, determines the **effective** opening of a sieve, that is, the opening corresponding to the largest size of the calibrated glass spheres that will just pass the sieve. This means that sieve analyses made at different laboratories with different sets of sieves, some of which may not even conform to specifications, can all be reported with reference to the same openings, and the discrepancies which now occur can be greatly reduced.

★ ★ ★

Evaluation of the effective opening of a sieve with the glass spheres is easily accomplished by sieving a calibrated sample of the spheres in exactly the same manner as in the usual sieve analysis. This sample contains a continuous distribution of sphere sizes. The weight percent passing the sieve is evaluated, and the effective opening of the sieve can then be read directly from a calibration curve supplied with the sample. Once the effective size of each of a set of sieves is known, all sieve analyses made with the set can be corrected by a simple graphical process to give the same values as a set of standard sieves.

★ ★ ★

Glass beads of the type used for highway markings have been found a suitable source of glass spheres from 80 to 1000 microns in diameter (U. S. sieves No. 170 through 18). Separation of the truly spherical beads from the others is accomplished by allowing the beads to fall on a slowly rotating disk set at a slight angle to the horizontal. A gentle blast of air starts the beads rolling, and the spherical ones quickly travel in a fairly straight path to the edge of the disk where

they fall into a container. The imperfect spheres and jagged pieces roll more slowly, or not at all, and thus tend to remain on the disk longer. These are carried on with the turning disk and fall into the discard hopper. The jagged pieces are cleared away by a more vigorous blast of air.

★ ★ ★

Next, the mixture of glass spheres is carefully selected to obtain a continuous distribution of sizes. Individual samples for sieve calibration are then chosen from the master mixture in such a way as to contain the same continuous distribution of sphere sizes.

★ ★ ★

The calibration of the sphere sizes is obtained by actually measuring the diameters of selected samples of the spheres. The diameters are obtained from their projections on a screen. A total of 14,000 glass-sphere diameters are required for each calibration. The reproducibility in the calibration of the glass spheres has been shown to be about 1 percent of the size of the sieve opening. This is significantly less than the variation—from 2 to 7 percent—allowed in the present specifications for testing sieves.

★ ★ ★

"Wrapping It Up for Industry"

An interesting booklet published under the above title by the Angier Corporation, Framingham, Mass., tells of the various types of wrapping machines and papers that have been developed by the Company in their fifty-six years of existence.

★ ★ ★

Through proper wrapping, many types of products produced by industry, including wire, can be prepared for shipment to customers with the certain knowledge that they will arrive in good shape—neither damaged nor rusted.

★ ★ ★

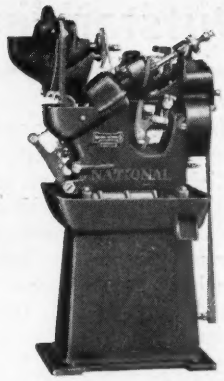
One of the first Angier products, a moisture resistant paper called "Keepdry", was produced in 1899, gaining wide popularity. Since then many other specialized paper—and machines to apply them—have been brought out.

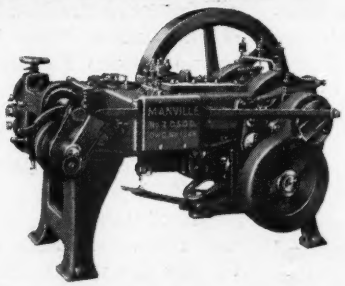
★ ★ ★

A copy of this booklet is available to any of our readers upon request direct to the company.

★ ★ ★

For Sale
NUT and BOLT MACHINERY





Listed below are machines for a complete nut and bolt plant capable of making a full range of nuts, bolts, rivets and special fasteners—from 3/16" to 5/8" dia. by 6" long cold, and up to 1 1/2" dia. hot by practically any length. All equipment was in operation when we acquired it, and is in operable condition now. Plant would require 20 men operators, 10,000 to 15,000 sq. ft., plus shipping space. Large number of tools and dies included with each machine for production of standard sizes. Tools and dies alone worth our asking price for the complete plant. Listed in second column are single machines available now. Write, wire or telephone your inquiries today.

LIST OF MACHINES IN COMPLETE PLANT

			blanks per minute
HEADERS — AUTOMATIC			
1—#0	Manville SSSD Header	— 3/16" x 1 3/8"	— 150
1—#2	" DSSD "	— 5/16" x 2 1/4"	— 80
1—#3	" SSOD "	— 3/8" x 4 1/2"	— 80
1—#3	" DSOD "	— 3/8" x 4 1/2"	— 65
1—#4	" DSOD "	— 5/8" x 6"	— 55
1—#3½	Waterbury-Farrel DSSD "	1½" x 3½"	— 50
AUTOMATIC TRIMMERS			
1—#2	Waterbury-Farrel Trimmer	3/8"	— 65
1—#3	" "	½" x 5/8"	— 55
1—#4	" "	5/8" x ¾"	— 50
THREAD ROLLERS			
1—#20	Waterbury-Farrel		
	" Thread Rollers—Auto.	3/8"	— 75
1—#20	" " " Hand	3/8"	— 75
2—#30	" " " Hand	½"	— 60
1—#50	" " " Hand	¾"	— 40
COLD PUNCH NUT MACHINES—AUTOMATIC			
1—¼"	Waterbury-Farrel CPN Machine		— 100
2—3/8"	" " "		— 70
AUTOMATIC NUT TAPPERS			
1—¼"	National Automatic Nut Tapper		— 60
3—3/8"	" " " "		— 45
1—½"	" " " "		— 30
1—5/8"	" " " "		— 20
SEMI-AUTOMATIC TAPPERS			
2—½"	Acme 6 Spindle Nut Tappers		— 130
1—1"	" " " " "		— 50
1—1½"	" " " " "		— 20
MISCELLANEOUS			
1—½"	Howard Iron Works Hot Pressed Nut Machine		
1—1½"	National Center Feed Hot Pressed Nut Machine		
1—1½"	Acme Semi-Automatic Nut Burring Machine		
1—1"	Acme Continuous Motion Hot Rivet & Bolt Header		
1—¾"	Waterbury-Farrel Semi-Automatic Flash Bolt Trimmer		
1	Pawtucket ½" Hammer Header for Hot Bolts		
1	Kent 5/8" — 2 Spindle Semi-Automatic Pointer		
1	Manville ¾" Automatic Pointer		
5	Acme & Landis Bolt Threaders 2 & 3 Spindles — Capacity ½" to 1½"		
1	Tumbling Barrel		

INDIVIDUAL MACHINES

COLD SHOP EQUIPMENT

2—WATERBURY-FARREL AUTO. COLD PUNCH NUT MACHINES, Capacity ¼" U. S. S. nut blank, Blanks per minute 100 max., 48,000 blanks per day. Automatic roll feed. Floor space 61" x 59". Wt. approx. 3200#.

2—WATERBURY-FARREL AUTO. COLD PUNCH NUT MACHINES, Capacity 3/8" U. S. S. nut blank, Blanks per minute 70 max., 33,600 blanks per day. Automatic roll feed. Floor space 60" x 72". Wt. Approx. 6000#.

2—#3 MANVILLE D.S.O.D. COLD HEADERS, Capacity 3/8" dia., Capacity 4½" Length under head. Blanks per minute 65, blanks per day 31,200. Stroke of slide 6". Floor space 66" x 96". Wt. approx. 12,000#.

1—#22 WATERBURY-FARREL D.S.S.D. COLD HEADER, Capacity 3/8" x 3". Blanks per minute 75, Wt. approx. 11,000#.

1—#3 WATERBURY-FARREL AUTO. BOLT HEAD TRIMMER. Capacity ½" dia. Capacity 6" length under head. Blanks per minute 55, blanks per day 26,400. Stroke of ram 7½". Floor space 50" x 91". Wt. approx. 4600#.

1—#20 WATERBURY-FARREL HAND FEED HORIZONTAL THREAD ROLLER. Capacity 3/8" dia. Capacity 2" length of thread. Blanks per minute 75 max. Blanks per day 36,000. Length of dies 6" x 6¾". Floor space 48" x 70". Belted motor drive, AC motor, 3/60/220. Wt. approx. 2800#.

1—#40 WATERBURY-FARREL HAND FEED HORIZONTAL THREAD ROLLER. Capacity 5/8" dia. Capacity 4" length of thread. Blanks per minute 50, blanks per day 24,000. Length of dies 9" and 10". Belted motor drive, AC motor, 3/60/220. Floor space approx. 52" x 94". Wt. approx. 7000#.

HOT SHOP EQUIPMENT

1—ACME 6 SPINDLE SEMI-AUTO. NUT TAPPER, Cap. ½" nuts, Est. production 130 blanks per minute, 62,400 blanks per day. Wt. approx. 2000#.

2—ACME 6 SPINDLE SEMI-AUTO. NUT TAPPERS, Cap ¾" nuts, Est. production 100 blanks per minute, 48,000 blanks per day. Wt. approx. 2500#.

1—ACME 6 SPINDLE SEMI-AUTO. NUT TAPPER, Cap. 1" nuts, Est. production 50 blanks per minute, 24,000 blanks per day. Wt. approx. 3500#.

1—ACME 6 SPINDLE VERTICAL NUT TAPPER, Cap. 1½" nuts, Est. production 20 blanks per minute. 9600 blanks per day. Wt. approx. 5000#.

1—BLISS SEMI-AUTO. BOLT HEAD TRIMMER, Cap. 5/8" dia. hex or square. Cap. 4"—4½" length under head. Six position dial-automatic ejection. Stop motion, clutch operated, Floor space 46" x 56". Wt. approx. 2800#.

2—TUMBLING BARRELS, Horizontal hexagon type. Approx. 24" x 36". Belt driven.

1—1" ACME UPSETTING & FORGING MACHINE, Box type slides, stop motion with pin clutch. Late type solid web flywheels. Toggle type side die grip with overload relief. New crankshaft (not installed) with machine. Belt driven. Wt. approx. 11,000".

1—PAWTUCKET ½" HAMMER TYPE HOT BOLT HEADER. Capacity ½" dia. x practically any length. Forges finished bolt head in one operation. Belt driven—clutch operated. Wt. approx. 4000#.

1—NATIONAL HOT PRESSED NUT MACHINES, Cap. 1" square or hex. Wt. approx. 14,000#.

1—1½" ACME UPSETTING & FORGING MACHINE, Cap. 1½" hot bolts. Wt. approx. 16,000#.

1—¾" ACME UPSETTING & FORGING MACHINE, Cap. ¾" hot bolts. Wt. approx. 7000#.

1—¾" WATERBURY-FARREL SEMI-AUTO. FLASH TRIMMER. Cap. ¾" hot bolts, Wt. approx. 4000#.

1—1" WATERBURY-FARREL VERTICAL BAR SHEAR.

1—¾" PAWTUCKET HAMMER BOLT HEAD.

1—¾" MANVILLE AUTOMATIC POINTER, Wt. approx. 3000#.

5—ACME & LANDIS ½"—¾" x 1½" BOLT THREADERS, 2 & 3 Spindles. Wt. approx. 6000# each.

ACME EQUIPMENT CO. INC.

ACME EQUIPMENT CO. Inc.

128 S. CLINTON ST · ANdover 3-3430 · CHICAGO 6, ILL.

STROM JOHNSON MACHINERY COMPANY

8800 S. VINCENNES AVE. CHICAGO 20 · TELEPHONE HUDSON 3-5400

Outstanding Personalities of the Wire Industry

The Electric Furnace Company Elects R. E. Coe Asst. to President

Richard E. Coe was elected Assistant To The President of **The Electric Furnace Company,** Salem, Ohio, at a meeting of the Board of Directors held at the head office of the company in Salem, Ohio, Monday, January 15th.

★ ★ ★

Mr. Coe was formerly connected with the Electric Furnace Company in the capacity of Fuel Engineer and more recently has been associated with the North American Mfg. Company as District Manager. He resides at 1006 Jennings Avenue, Salem, Ohio.

★ ★ ★

Other officers of the Company are as follows:

K. U. Wirtz, President
C. L. West, Vice President
F. T. Cope, Treasurer
R. D. Painter, Secretary
R. E. Coe, Assistant to the President
C. H. Vaughan, Assistant Vice President

★ ★ ★

Hudson Wire Adding A Mid-West Plant

To serve its growing clientele of wire users in the Mid West and Far West, **Hudson Wire Company** announces plans for the early erection of a new magnet wire plant at Cassapolis, Mich. With general offices in Ossining, N. Y., this company, one of the oldest manufacturers of fine wires, now operates plants at Ossining, N. Y., Winsted and Norwalk, Conn. and Pownal, Vt., for the production of bare and insulated wires for electrical and radio-electronic applications, as well as wires and screen for mechanical and chemical needs.

★ ★ ★

The selection of Cassopolis as the site for the latest plant is the result of extensive surveys and studies by **Robert M. Akin, Jr.,** President, **O. F. Bitzer,** V. P., and **Carl M. Myers,** Western Representative of the company.

★ ★ ★

No definite date has been set by Hudson Wire Company for the start of construction, but a definite decision is expected as soon as there is a satisfactory classification of the probable civilian production controls in the present rearmament plans. The demand for bare and insulated fine wires has risen to such high levels as to demand Hudson Wire production facilities in the Mid West to match those that Eastern wire users have long enjoyed from present plants.

★ ★ ★

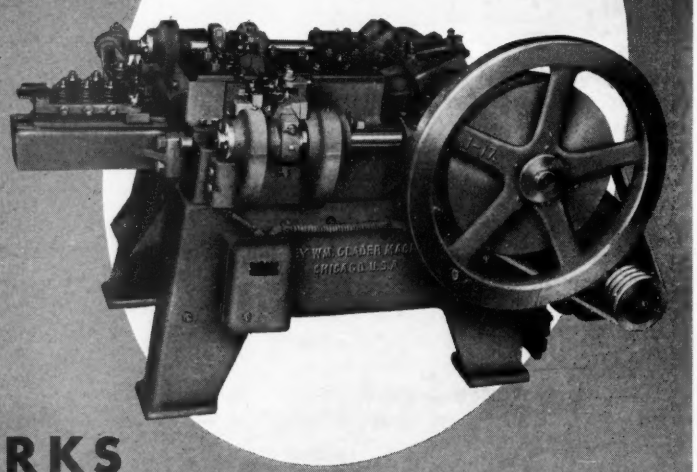
Making Tour of Wire Mills in Europe

John P. Zur, Chief Engineer of the **Trauwood Engineering Company,** Cleveland, Ohio, left on February 4th for a month-long visit to various wire mills in Europe.

★ ★ ★

While the primary purpose of his visit is to place in operation a new 16-strand Trauwood installation for patenting, annealing and tempering

high efficiency — low cost
with GLADER wire nail machines



Eliminate costly down-time in the Nail Mill by replacing obsolete machines with new GLADER NAIL MACHINES . . . For tops in efficiency and economical operation use GLADERS.

WM. GLADER
MACHINE WORKS

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carbon steel wire at the plant of Sambre Escaut S. A., Hemixen, Belgium, near Antwerp, he will also visit other mills in England, Belgium, France, Italy and Holland, many of which now have Trauwood equipment.

★ ★ ★

The new installation will heat-treat wire and rod from 0.9 m m to 10.0 m m diameter, with a production of 18.00 kilograms of wire treated per hour.

★ ★ ★

Quigley Made President of Naugatuck Valley Council

The board of directors of the Naugatuck Valley Council has elected **Arthur H. Quigley,** president of the American Brass Company, as council chairman. He succeeds Bennet Bronson who died November 23rd.

★ ★ ★

Leavenworth P. Sperry, president of the Scovill Manufacturing Company, was elected a director to succeed Clark S. Judd, chairman of the board of directors of the American Brass Company.

★ ★ ★

The board at its annual meeting also elected Richard L. Wilcox, president of the Waterbury Farrel Foundry & Machine Company, as a director. He succeeds David C. Griggs, chairman of the board of the Farrel Foundry, who had resigned.

★ ★ ★

R. B. Steinmetz Made General Manager Of Mills For Anaconda

The Anaconda Wire & Cable Company has announced the appointment of Richard B. Steinmetz as general manager of mills with headquarters at Hastings-on-Hudson, New York.

★ ★ ★

Mr. Steinmetz joined the Anaconda organization in 1929 with the American Brass Company. In 1930 he transferred to the Anaconda Wire & Cable Company at Hastings-on-Hudson.

★ ★ ★

Mr. Steinmetz was made manager of the Marion mill in 1948, and held that position until his new appointment as general manager of all mills of the company.

★ ☆ ☆

Bennet Bronson

Bennet Bronson, 62, administrative vice president of the **Scovill Manufacturing Company** and chairman of the Naugatuck Valley Industrial Council, died on November 21st.

★ ★ ★

Leavenworth P. Sperry, president of Scovill, voiced official and personal regrets over Col. Bronson's death. Mr. Sperry stated that "He was a great citizen, a descendant of the first settlers of Waterbury, and a member of a family prominent in community affairs for generations. His ability as a manufacturer was outstanding and we, his friends and associates, will miss him greatly".

★ ★ ★

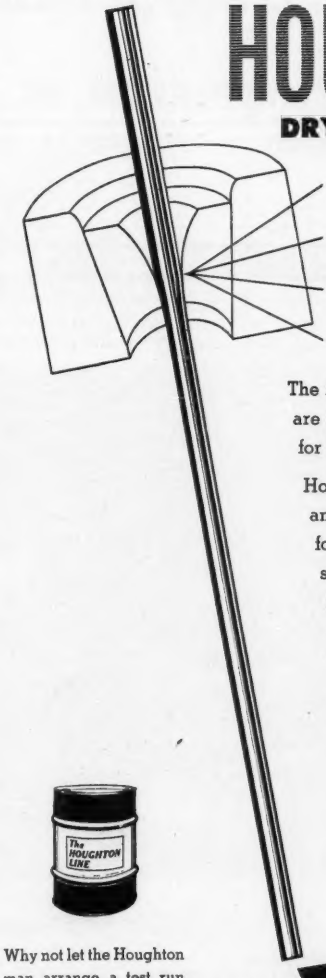
Mr. Bronson became affiliated with the Oakville Pin Co. in 1909 and served successively as assistant treasurer, vice president and president. When the company merged with Scovill in 1923 as the Oakville Co. division he was elected vice president and general manager. Under his direction the plant became one of the world's largest manufacturers of pins and wire fastening devices. He resigned as head of the Oakville division in 1947 to become administrative executive of Scovill.

★ ★ ★

No More Liming Hazards in Bar and Rod Drawing!

HOUGHTO-DRAW

DRY FILM DRAWING COMPOUND



. . . won't rupture under extreme pressures

. . . provides "controlled friction" lubrication

. . . permits faster, "chatter-free" drawing

. . . prevents "welding" of die and work

The fast-growing number of Houghto-Draw users are finding it superior in many ways as a replacement for lime coating.

Houghto-Draw dry film drawing compound is cleaner and easier to handle in preparing hot or cold rolled bars for cold drawing. It keeps the surface of bars smooth and the finish brighter. It requires only one immersion. And much less time and heat are needed to bring the Houghto-Draw solution to proper working temperature. Its thin film (approximately .001") is easily removed.

Houghto-Draw underwent extensive testing in actual production before it was offered to industry a year ago. Ample performance records are available to show you how it can improve your bar quality and output. For further information, write E. F. Houghton & Co., Philadelphia 33, Pa.

Why not let the Houghton man arrange a test run in your mill to prove Houghto - Draw's advantages to you? Meantime, write for information.

HOUGHTO-DRAW
. . . a product of
E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

DAVIS EQUIPMENT . . .

FOR ELECTRIC WIRE MANUFACTURE

AUTOMATIC SPARK TESTER — For the accurate location of dielectric faults in insulating wire coating. Used in continuous line with plastic extruders or curing equipment. Voltage range of 3,000 to 16,000 volts.

CAPSTAN — Motor-driven, variable speed, for use with high-speed plastic extruders. Standard speeds of 100 to 1500 r.p.m. Higher speed gearing can be provided.

PAY-OFF STAND — Controls tension at wire and brakes automatically and smoothly.

TAKE-UP STAND — Automatically stops when dielectric faults are indicated by the SPARKER. Designed particularly for use with high-speed plastic covering machines.

AUTOMATIC RE-SPOOLER—Layer winds parallel cords. Has motor driven traverse with adjusting stops. Good not only for insulated wire, but for bare wire.

DAVIS EQUIPMENT IS RUGGED AND RELIABLE

Design for continuous, fast, precision operation.

Write us today for detailed information!

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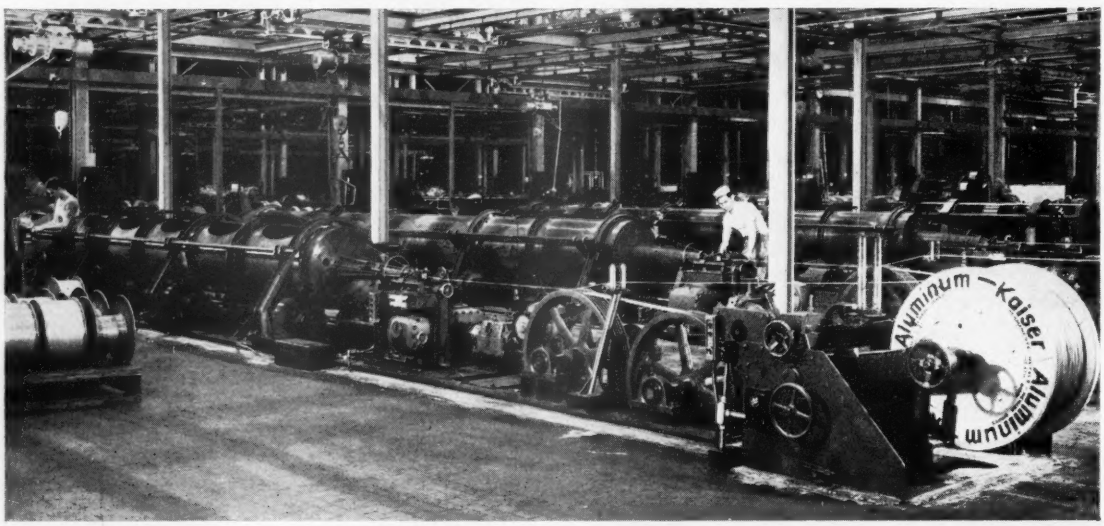
THE R. L. DAVIS ELECTRIC CO., INC. • WALLINGFORD, CONN.

SPARK TESTERS • SPOOLERS • TAKE-UPS • CAPSTANS

NEW 22" SPOOL 750 RPM TUBULAR STRANDER

HYDRAULIC LIFT REEL STAND — INFINITELY VARIABLE TRAVERSE AIR CONTROLLED
ROUBLE DRUM HAUL-OFF WITH LINK BELT P.I.V. — AIR OPERATED BAKING SYSTEM



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WIRE & PROCESS MACHINERY

Hi-Efficiency

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Hooker Electrochemical Co. Appointments

R. Lindley Murray was elected president and **Edwin R. Bartlett,** chairman of the board of **Hooker Electrochemical Co.,** Niagara Falls, N. Y. Mr. Bartlett had been president since 1945.

★ ★ ★

Soler Leaves Atlas Steels

Gilbert Soler has resigned as vice president in charge of manufacturing operations and director of **Atlas Steels Ltd.,** Welland, Ont., Canada, which he joined in 1946.

Nopco Appointment

John N. Gannon has been made Southern District Manager for **Nopco Chemical Company,** Harrison, N. J., replacing G. H. Small, deceased. In the Central District, from which Mr. Gannon was transferred, he is replaced by **Travis V. Rankin. Russell F. Gasnier** has been added to the New England sales staff.

★ ★ ★

Among the many products that Nopco makes are metallic soaps, stearates and palmitates. The company also makes a variety of wire drawing soaps.

★ ★ ★

Sterling Bolt Appointments

Herbert Gordon has been elected president of Sterling Bolt Co., Chicago, replacing **Charles C. Gordon,** who retired as president after more than 30 years with the company. Charles C. Gordon becomes chairman of the board of directors. Other changes in personnel: **Harry Dorph,** associated with the company since its inception, has resigned, but will continue to serve on the board of directors. **P. T. Phillips,** elected vice-president and secretary.

★ ★ ★

Dr. Gonser in New Post at Battelle

As a result of science and industry's current great interest in the technology of the less common metals, **Battelle Institute,** Columbus, Ohio, has created a new assistant directorship. **Dr. Bruce W. Gonser,** a pioneer in the field, has been named to the post.

★ ★ ★

Dr. Gonser will guide development of Battelle's enlarged program in up-to-now unexplored fields of metallurgy and the chemistry of metals. A veteran member of the Battelle staff, he will continue also to direct much research in nonferrous metallurgy.

★ ★ ★

At Battelle alone the dollar volume of research on the less common metals now surpasses one million dollars per year, according to Battelle Director Clyde Williams.

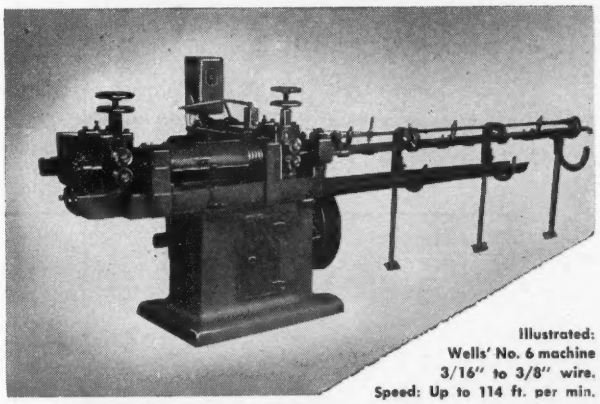
★ ★ ★

Dr. Gonser is known for his contributions to the technology of tin, zinc, antimony, titanium, zirconium, cadmium, tantalum, molybdenum, germanium, indium, gallium, tungsen, and chromium. He is American manager of the Tin Research Institute, chairman of the Rare Metals Committee of the Electrochemical Society, and chairman of the Committee on Reduction and Refining of Titanium and Uncommon Metals of the American Institute of Mining and Metallurgical Engineers. He is also active in the work of the American Society for Metals, the American Society for Testing Materials and the Wire Association, having presented technical papers before this group on several occasions.

★ ★ ★

TOUGH JOBS WON'T STOP A WELLS STRAIGHTENER AND CUTTER

Here's what one user has been doing:



Illustrated: Wells' No. 6 machine 3/16" to 3/8" wire. Speed: Up to 114 ft. per min.

Cutting 3/8" hot rolled rods for 9 long years 24 hours a day.

His Wells machines are still going strong. Because of the scale, this concern says it is an exceedingly tough job - but the Wells machines take it.

The machines are cutting at 120F.P.M., with tolerances of 1/8" in this plant. Nine years of steady operation is a long test. What these machines can do for one they will do for you. Made in sizes to handle 1/16" to 5/8" stock.

Every WELLS machine is backed by 57 years of experience and all our efforts are directed toward making good machines better. WELLS machines are rugged, dependable accurate *and low in cost.*

Get the facts today. Send for Catalog No. 50 describing this and other Wells wire working machinery. Address inquiries

Frank L. Wells Company

5821 FIFTH AVENUE

KENOSKA **WISCONSIN**

Builders of Wire Making Machinery

J. S. Cowan to New Post in National Electric Products

Joseph S. Cowan has been appointed manager of government business for **National Electric Products Corporation**, of Pittsburgh, it has been announced by R. C. Bennett, Jr., vice president and sales manager. He will make his headquarters at the firm's Washington, D. C. sales office. Mr. Cowan, who joined National Electric in 1939, formerly had supervised sales of the Company's wire and cable in the Washington District.

★ ★ ★

T. M. Linton, who has been attached to the Washington Office since 1937 has been named to succeed Mr. Cowan in charge of wire and cable sales.

★ ★ ★

Jeff Crum Joins R. H. Miller

The R. H. Miller Company of Homer, N. Y., manufacturers of "Steelskin" brand wire drawing lubricants, recently announced the association of **E. Jefferson Crum** with their company as sales and service representative of their line of metal working products.

★ ★ ★

E. Jefferson Crum * * * * *

Mr. Crum, probably best known to wire men as the inventor of the "Crum Calculator for Wire Draftings", has for the past several years served as General Foreman of Wire Drawing at the Sparrows Point plant of the Bethlehem Steel Company.

★ ★ ★

A native of Illinois, Mr. Crum received his B.S. in Metallurgy degree from the Missouri School of Mines and Metallurgy at Rolla, Missouri, in the "Bethlehem Loop Course". After various metallurgical assignments in the open hearth and rolling mills, he entered wire operations with the advent of Bethanized wire and was closely associated with the development of the plant and product under John Mordica and Carl E. Johnson.

★ ★ ★

In the past ten years Jeff Crum has taken an active part in the affairs of the WIRE ASSOCIATION, having been runner-up for the 1943 Medal Award, contributing to WIRE AND WIRE PRDOUCTS and serving on program committees.

★ ★ ★

"Basing Point Pricing Systems under the Federal Antitrust Laws"

George H. Sage, member of the New York Bar, has prepared a book of the above title that is a legal, business and economic analysis of the pricing systems. This book is published by the Thomas Law Book Company, 209 No. Third St., St. Louis 2, Mo. It sells for $10.00, but will be sent on approval for a 10 day inspection period, to be either paid for or returned at the end of that period.

★ ★ ★

WIRE SPOOLS, ALL-STEEL, LITHOGRAPHED

Ends and traverses may be shipped separately and assembled easily in your plant on a hand, foot, or power press.

5" and 6½" diameter ends with 1-15/16" diameter traverses.
10½" diameter ends with 3½" diameter traverses.
Traverse lengths up to 12".

J. L. CLARK MANUFACTURING CO.
600 23rd AVENUE • ROCKFORD, ILLINOIS

A Review of Recent Wire Patents

No. 2,536,034, HIGH-TEMPERATURE STAINLESS STEEL, patented January 2, 1951 by William Charles Clarke, Jr., Dundalk, Md., assignor to Armco Steel Corporation, a corporation of Ohio.

Austenitic chromium - nickel - cobalt stainless steel is patented containing about 12% to 22% chromium, at least 5% but less than 10% nickel, from 4% to 40% cobalt, from small quantities up to about 2% manganese, 1% to 4% molybdenum, 2% to 4% copper, 0.01% to 0.35% carbon, from 0.15% to 0.75% titanium, 0.20% to 1.10% columbium, and the remainder all iron.

★ ★ ★

No. 2,536,582, TOOL FOR USE IN ARMATURE WINDING MACHINES, patented January 2, 1951 by William Swift, Sutton Coldfield, England, assignor to Joseph Lucas Limited, Birmingham, England.

A wire gripping and severing tool is provided comprising three coaxial parts having mutually adjacent end faces and having around their peripheries grooves correlated with the number of the grooves in the armature to be wound, one of the parts being angularly movable relatively to the adjacent part for gripping the wires, and the latter part being angularly movable relatively to the third part for severing the wires.

★ ★ ★

No. 2,536,585, ANIMAL TRAP, patented January 2, 1951 by George Titus, Minto, Alaska.

This trap is comprised of wire forming the trap body as well as the trigger operating springs.

★ ★ ★

No. 2,536,885, METHOD OF MAKING MULTICONDUCTOR CABLES, patented January 2, 1951 by John W. Olson, Ardsley on Hudson, N. Y., assignor to Anaconda Wire and Cable Company, a corporation of Delaware.

Around each wire are rubber insulation and then cotton braid, asphaltic saturant and paper. About the thus insulated wires are a sheet coated with bitumen on the outside and an outside fibrous jacket properly saturated.

★ ★ ★

No. 2,536,939, WIRE DISPENSER, patented January 2, 1951 by Robert E. Johnson, Chicago, Ill.

The inventor provides a hand dispenser for highly resilient wire.

★ ★ ★

No. 2,537,035, METHOD OF COATING STAINLESS STEEL, patented January 9, 1951 by Irvine C. Clingan, Baltimore, Md., assignor by mesne assignments, to Armco Steel Corporation, a corporation of Ohio.

In the blackening of articles and products containing at least 10% chromium, the inventor treats the articles or products in a molten salt bath consisting of salts of sodium dichromate or potassium dichromate, and circulating gas containing free oxygen through the bath during such treatment.

★ ★ ★

No. 2,537,817, MACHINE FOR APPLYING CLIPS TO SPRINGS OR THE LIKE, patented January 9, 1951 by Charles C. Edwards, High Point, N. C.

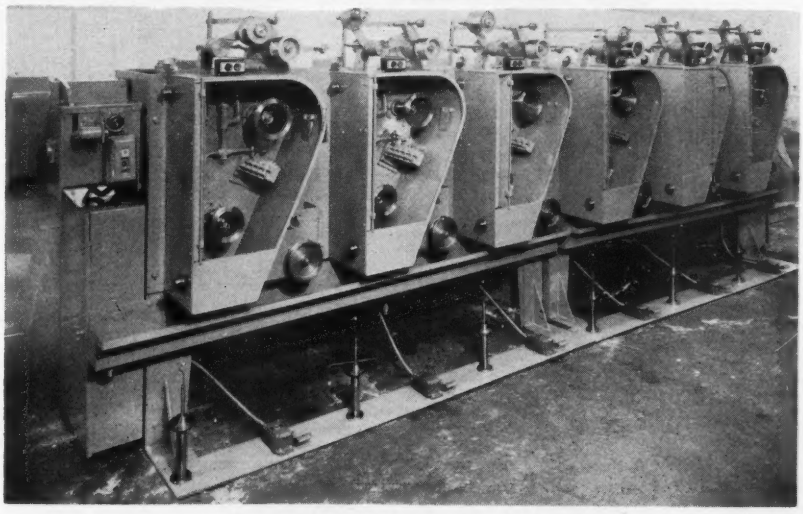
The springs are of the helical kind and the machine forms and applies the clips even with the springs are arranged in close relation.

★ ★ ★

No. 2,537,884, WIRE STRIPING MACHINE, patented January 9, 1951 by George E. Forsberg, Worcester, Mass., assignor to Surprenant Electrical Insulation Company, Clinton, Mass., a corporation of Massachusetts.

Wire is moved vertically through the machine to encounter a striping unit rotating about the wire and having a cavity radiating from the wire. Rotation causes fluid ink in the cavity to be held spaced from the wire by centrifugal force due to rotation of the unit. A striping roller rotatably mounted on the unit in the cavity partly immersed in the ink and revolves about the wire by the unit and has rolling engagement with the wire and is turned by the latter due to the rolling engagement and vertical movement of the

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.



FINE WIRE DRAWING MACHINE
6 Unit Model No. 934
For volume production on minimum floor space.
Individual Motor Drives.
Ball-Bearing Mounted Throughout.

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"American" Insulating Machinery Company
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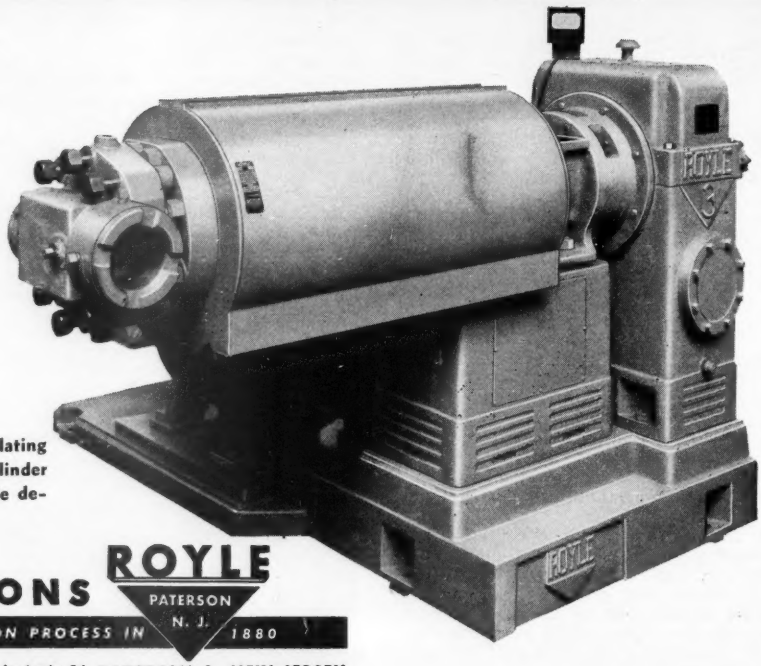
Please write for details. We are always at your service.

Builders of machinery for the Wire Industry

ROYLE *for WIRE INSULATING*

- Continuous Vulcanizing Machines for Rubber Wire Insulation
- Plastic Wire Insulation Machines
- Strainers • Cooling Troughs
- Light Wire & Cable Capstans
- Motorized Take-Ups
- Temperature Control Units for Extrusion Processes and other industrial uses



ROYLE # 3 Plastic Wire Insulating Machine. Double extended cylinder enclosed in insulating jacket, side delivery head.

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. REgent 2430
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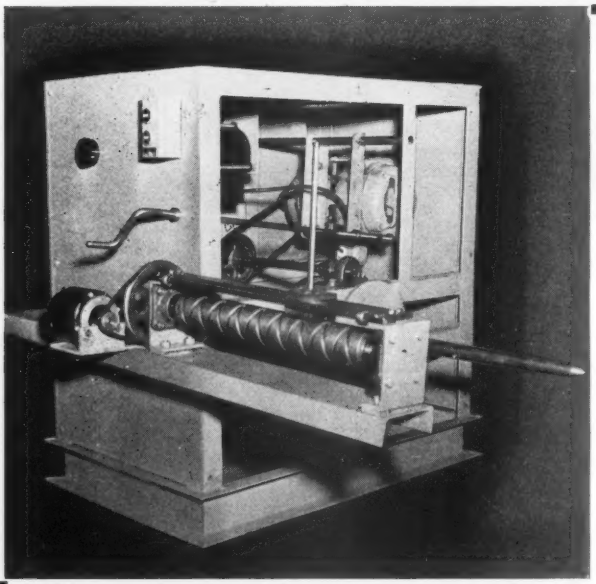
Akron, Ohio — J. C. Clingfelter JEfferson 3264
Los Angeles, Cal. — H. M. Royal, Inc. LOgan 3261

PATERSON 3, NEW JERSEY



Announcing:

NEW FEDERAL TAKE-UP WIRE EQUIPMENT

These machines are equipped with variable torque controls. They are new in design, so engineered and built as to be the *most efficient take-up machines on the market.*

Have wide range of speeds—up to 2500 ft. per min. Heavy, rugged steel construction gives long life and smooth dependable service.

Write today for literature

FEDERAL CAPSTANS embody designs and features worked out in actual mill experience and that are based on practical mill needs. Their superior performance and unusual versatility will please you. They are economical, sturdy and well-made.

Federal Manufacturing Co.

SPECIAL WIRE MACHINERY

236-240 Hall Avenue, Wallingford, Conn.

wire to move ink onto the wire to stripe the latter.

★ ★ ★

No. 2,538,414, METHOD OF MAKING WIRE-WRAPPED BELTS, patented January 16, 1951 by Melvin A. Crosby, Dayton, Ohio, assignor to The Dayton Rubber Company, a corporation of Ohio.

This method comprises forming three hollow tubular superimposed sections of metal cloth, filling the two outer sections with rubber material and the intermediate section with rubber material reinforced by a number of cords parallelly arranged to each other and to the longitudinal axis of the tubes, wrapping this superimposed filled sections with a wet cloth, and vulcanizing the assembled parts under heat and pressure.

★ ★ ★

No. 2,538,644, WIRE CRIMPING MACHINE, patented January 16, 1951 by Joseph R. Guess, El Monte, California.

The crimped wire is provided with spaced apart crimps and indentations spaced from and offset with respect to the crimps.

★ ★ ★

No. 2,538,676, COLLAPSIBLE LAMP SHADE, patented January 16, 1951 by Robert D. Enright, Calumet City, Ill.

A skeleton for a shade is provided, formed wholly of wire.

★ ★ ★

No. 2,539,540, REGULATING MECHANISM FOR WINDING ROLLED MATERIAL, patented January 30, 1951 by Karl Henrik Idar and Gunnar Lindah, Vasteras, Sweden, assignors to Allmanna Svenska, Elektriska Aktiebolaget, Vasteras, Sweden, a corporation of Sweden.

Strips of wires are wound employing electro-mechanical means.

★ ★ ★

No. 2,539,599, ADJUSTABLE WIRE STITCHER MECHANISM, patented January 30, 1951 by Orville M. Tubbs, Chicago, Ill., assignor to Inland Wire Products Company, Chicago, Ill., a corporation of Illinois.

Wire staples are employed in this mechanism.

★ ★ ★

No. 2,539,745, APPARATUS FOR COILING AND CUTTING A CONTINUOUSLY MOVING WEB, patented January 30, 1951 by Frank J. Keller, Cleveland, Ohio, assignor to Wean Equipment Corporation, Cleveland, Ohio, a corporation of Ohio.

The apparatus comprises two sets of bending rolls journaled in a frame, a deflector for directing the web toward one or the other of the sets, and a pair of shear blades extending along the deflector adjacent thereto and movable across the path of the web to sever it and carry the severed leading edge of the web from one side of the deflector to the other.

★ ★ ★

New Safety Card Approved By Safety Directors

An illustrated, pocket size, card gives tips on proper care and use of slings for safe handling.

★ ★ ★

Safety directors and engineers voiced their approval at the recent National Safety Congress. Macwhyte Company, manufacturers of wire rope and braided wire rope slings created the card as a service to safety men for the promotion of greater safety in their plants.

★ ★ ★

Copies of card are available to superintendents, and safety directors for distribution to riggers, crane followers, floormen, and maintenance men. Request card #50-38 from Macwhyte Company, Sling Department, Kenosha, Wisconsin.

★ ★ ★

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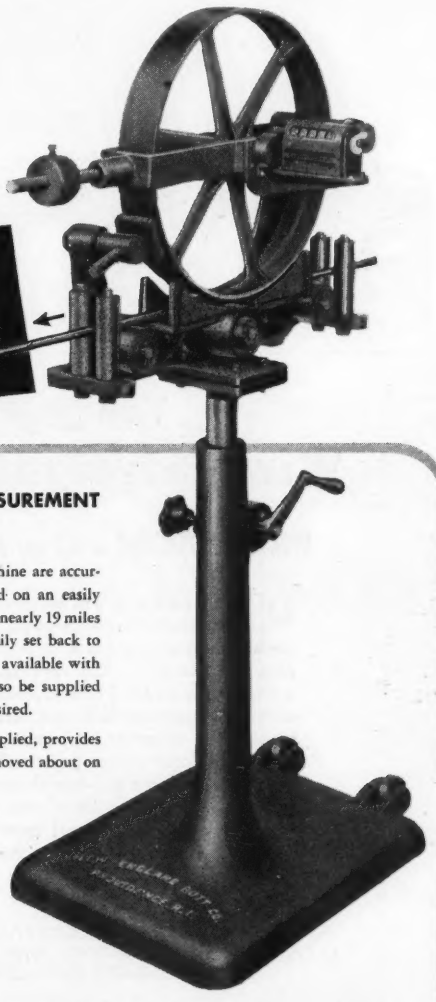
for the

1951 Wire Buyers Guide

NEBUTTCO

WIRE MEASURING MACHINES



FOR QUICK, ACCURATE MEASUREMENT OF WIRES OR CABLES . . .

Wires or cables passing through this machine are accurately measured and their lengths recorded on an easily read counter. Lengths up to 100,000 feet . . . nearly 19 miles . . . can be registered. Counter can be easily set back to zero at the start of a run. Machine is also available with counter mounted on right side. It can also be supplied with electric predetermined counter if desired.

Heavy cast iron standard, optionally supplied, provides firm support for machine, may be easily moved about on its rollers and adjusted to proper height by the rack and pinion. Machine illustrated is made in two sizes — No. 1 for measuring wires to $\frac{5}{8}$" diameter and No. 2 for wires to $1\frac{1}{2}$". We also manufacture a small bench type machine for measuring any flexible material not over $\frac{5}{16}$" diameter.

For complete specifications ask for Circular No. 1

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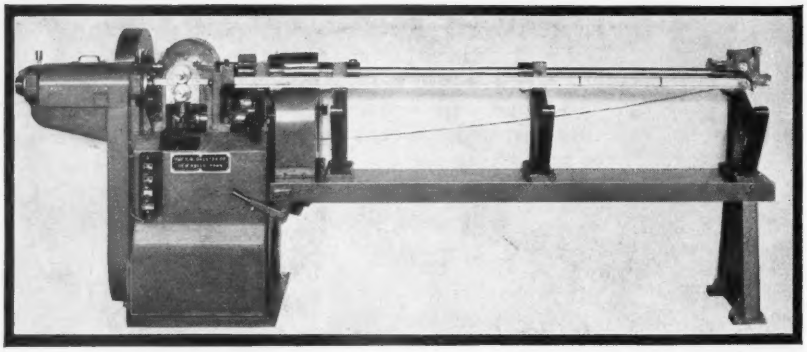

CAP.
1/16
TO
3/16"
DIA.

STRAIGHTENER SPECIALISTS FOR OVER 80 YEARS

Here are some of the refinements developed:

ALMOST CONTINUOUS WIRE TRAVEL—A LIGHTENING CUT-OFF THAT ASSURES SQUARE ENDS—A HIGH-SPEED, DIRECT-DRIVEN 5-DIE STRAIGHTENING FLIER—QUIET, EFFICIENT V-BELT MOTOR DRIVE—BALL & ROLLER BEARINGS THRUOUT—EXTREME RIGIDITY—TYPES FOR CAPACITIES FROM .025" to 11/16" DIAMETER

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Mfd. by METTLER MACHINE TOOL, INC., 132 W. Lawrence St., New Haven, Conn.

SHUSTER *Automatic* — *Since 1866* — WIRE STRAIGHTENING AND CUTTING MACHINES

The SPECIALISTS in Wire-Straightening and Wire-Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

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ALL TYPES OF WIRE...

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- Bronze
- Brass
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TELEPHONE: CEdar 4702

Knitted Coverings for Wire and Cable, Part II, The Economics of Knitting

(Continued from page 222)

After the wire is covered, a coat of asphalt is applied in another process and then a surface coat of wax is added. To provide smooth surface and uniform diameter the wire is then drawn through a die, the size of which is determined in the A.S.A. Specifications for each size wire.

★ ★ ★

As the asphalt costs less than the cotton yarn it is economical to attempt to apply not more than 30% of the weight of the insulation in the knitted coverings.

★ ★ ★

With the knitter, the yarn weight can be more accurately controlled than it can on a braider because there are fewer yarns used in the knit cover, the yarn tension devices are simpler and there is no danger of difficulty because of poorly wound bobbins. This permits the application of only the minimum required amount of cotton yarn covering.

★ ★ ★

In addition to the standard usage of cotton yarns, experiments have also been conducted with rayons, nylons and glass yarns.

★ ★ ★

4. Operator Productivity

One operator is required for about 20 braiders and a part-time operator is required for the equivalent in backwinders. Therefore, one operator is required for the production from braiders and backwinders equivalent to that of one knitter. Since a knitter operator can handle up to six machines the knitter increases labor productivity 600%.

★ ★ ★

The three braided covers on wire involve three sets of carriers operating one above the other. About 12 carriers braid the first cover, 16 carriers braid the second cover and 20 carriers braid the third. Thus, a usual total of 48 carriers, each with two ends of yarn, are required to braid the three covers on the braiding machine. On the knitter 8 cones of two to five pounds each are needed on each cover, making a total of only 24 single cones or 24 ends of yarn for the operator to service.

★ ★ ★

The knitter is completely controlled with automatic electric stop motions which shut off the machine if a yarn breaks or when the wire or cable supply is exhausted.

★ ★ ★

While braiding machines require the use of small bobbins holding only a few ounces of yarn, the knitter can accommodate not only large cones weighing from 2 to 5 pounds, but many wire mills realize even greater economies by tying in the ends of 2 or 3 cones placed vertically, one above the other, so that their knitters can operate for hours without stoppage for change of yarn supply.

★ ★ ★

Because of their inherent design, braiding machines have considerably greater down time and require considerably greater maintenance than knitters which require the minimum of servicing.

★ ★ ★

5. Floor Space

The floor space required for one knitter including haul-off reel, wire supply stand and aisles is about 280 square feet per machine. The floor space required for 16½ braiders

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Hydraulic Cable Cutters
Take-up, Measuring and Pay-Off Equipment for Warehouse Use

(See Page 214 For News Of A New Automatic Dual Take-Up)

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30 YEARS OF SERVICE TO THE WIRE INDUSTRY

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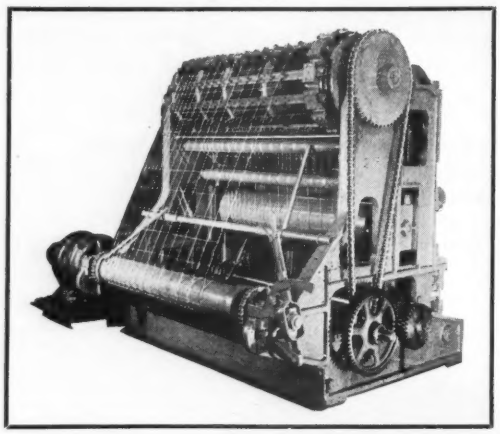

- Fastest — Most Efficient.
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- Years of Low Cost Production.

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Specialists In Fence Looms

MOSSBERG PRESSED STEEL CORP.

Greater service from a new All Welded Steel Take Off Reel designed to meet present day requirements.

Usual maintenance expense eliminated by adoption of this new design wherein all parts are welded into one homogeneous unit.

Reel sides are embossed with radial reinforcing ribs for increased rigidity with rolled edges for additional strength and to facilitate handling.

Complete line of spools and reels for both processing and shipping all kinds of bare and insulated wires and cables. (Send for Catalogue W-104)

All Welded Steel
Take Off Reel

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Pressed Steel Corp.
18 WEST STREET
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James Day (Machinery), Ltd., 90 Regent Street, London, W.I., England

and the necessary aisles, haul-off reels and supply stands is about 530 square feet. The floor space required for the backwinders necessary for 16½ braiders is an additional 125 square feet, making a total of 655 square feet. For the same production a knitter requires only 43% of the floor space.

★ ★ ★

6. Speed of Production

A comparison was made at one wire mill between knitter and braider production. The knitters were operated at a speed of 1840 feet per hour. In spite of interruptions due to changing reels, replacement of cones and repairing of broken yarn, the overall average production from knitters at the company was over 1650 feet per hour. The production rate of standard braiders at that same Company indicated a top speed of 130 feet per hour and an overall average of 100 feet per hour. One knitter is equivalent in production to about sixteen and one-half triple head braiders.

★ ★ ★

7. Maintenance Costs

Because of the inherent design of braiding machines, the frequent replacement of carriers and other parts is necessitated.

★ ★ ★

In addition to individual material costs, it has been found that braiding machines are far more consuming of the time of maintenance men and whereas one or more individuals are often assigned to the maintenance of a battery of braiding machines, it is now possible to achieve an equal or greater production of wire on knitters with only the part time supervision of one maintenance man.

★ ★ ★

8. Power Costs

By using knitters, which have individual 1 h.p. motor drives, over 1650 feet of triple covered wire or cable an hour can be produced with an electrical power consumption of only 0.8 k.w hours. When using braiding machines, 16½ triple head braiders each powered by 1/3 to ½ h.p. motors are required to produce 1650 feet of triple covered wire or cable an hour and electrical power of 4.4 to 6.6 k.w. hours is consumed.

★ ★ ★

9. Working Conditions

One of the principle indirect advantages of using knitters is that the substantial annoying departmental noise usually associated with braiding machines is practically eliminated.

★ ★ ★

The improvement in working conditions that results from such a noise reduction and the consequent decrease in operators' nervous fatigue can best be appreciated by those who have had some experience in a department where a large number of braiders were in operation.

★ ★ ★

The working level of the wire on knitters is waist high; easily accessible for starting new lengths of wire. The wire travels on a horizontal plane making it very convenient for operation and inspection. The yarn supply itself is easily accessible being located on spindles at a normal working height. These two factors eliminate the crawling and stretching that are commonly associated with the operation of braiders.

★ ★ ★

10. Capital Investment

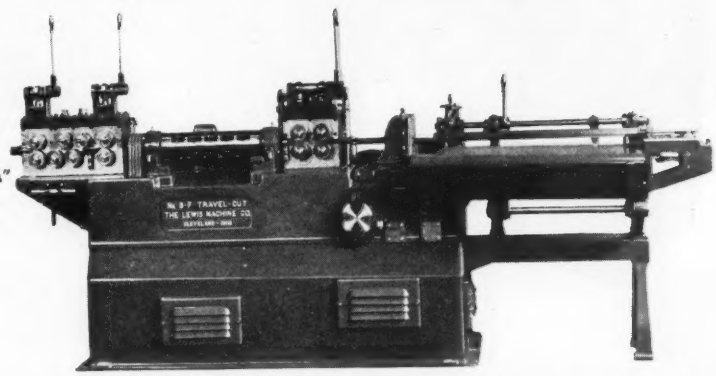
The preceding paragraphs have

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS **TRAVEL-CUT**

MACHINES



22 Models to handle from 1/16" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL CUT. Full details on request.

Write for your pocket-size Wire Gauge Chart. No obligation.

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WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California

CANADIAN: Empire Engineering Co., 11 Wellington St. E., Toronto 1, Ontario.

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shown that in each factor that must be considered in the manufacture of covered wire and cable it is advantageous to use the knitting method. Since this is true even in mills that already have a substantial capital investment in braiding and winding equipment, it is unquestionably true for any mill starting up a new operation or mills that are expanding operations. Based upon the productive capacity of knitters as against braiding machines, the investment required is considerably less for knitting equipment.

★ ★ ★

7. Conclusion

This article has been prepared to present the reader with a brief description of how a knitting machine works. It is realized that in so short a treatise it is impossible to cover the ground completely, especially as some mills have special and unique problems for which standard equipment may not be suited. Suffice it to say that many such situations can be met by adaptations of standard equipment or by specially engineered designs.

★ ★ ★

YOU CAN'T DO BETTER THAN NRM WIRE & CABLE COVERING EQUIPMENT

1½" Package Wire & Cable Covering Unit

Complete over-all dimensions, only 13 ft. x 4 ft. 2 in.
1½" oil or electrically heated extruder.
Crosshead for wire covering up to ¼" covered diameter.
Wire straightener.
Dual horizontal haul-off capstans. (Variable speed.)
Automatic driven let-off, controlled by wire tension.
Torque controlled dual take-up with 16" reels.
Space provided for wire heaters and spark tester.
Maximum wire speed, 1000 ft. per minute.
Net weight: 6400 lbs. (approx.)

● The 1½" machine shown above is typical of the precision equipment manufactured by NRM. Also available are 30" and 42" Combination Take-Up and Cooling Units for wire and cable 1/16" to ¼" and ¼" to 1½" covered diameter.

NRM wire and cable insulating crossheads and accessories are available for all sizes of extruders.

NYLON WIRE & CABLE COVERING EQUIPMENT

All sizes are available with special screws, cylinders and crossheads for covering nylon wire and cable—or may be equipped with special dies for other nylon extrusions.

NATIONAL RUBBER MACHINERY CO. General Offices & Engineering Laboratories Akron 8, Ohio

PLANTS at Akron & Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J. West: S. M. Kipp, Box 441, Pasadena 18, Calif.
EXPORT Plastics Machinery: OMNI EXPORT CORP. 460 4th Ave., New York 16, N. Y.

Creative Engineering

"Controls Guide"

The Journal of Commerce, 63 Park Row, New York 15, N. Y., has revived a service they conducted in World War II in the publication of a brochure called "Controls Guide". This covers new regulations concerning prices, production limitations and distribution.

★ ★ ★

Its aim is to help industrialists to spot quickly all regulations applying to any specific commodity. The currect issue is dated January 31, 1951. Other issues will be published as regulations change. Interested readers are invited to write to the Journal of Commerce for a copy.

★ ★ ★

The British Industries Fair

The largest display of engineering equipment ever assembled in one place, including scores of units in actual operation in a huge outdoor exhibition area, will be an outstanding attraction at the **1951 British Industries Fair,** according to the American Committee for the BIF.

★ ★ ★

To be staged in London and Birmingham, England, from April 30 to May 11, this great annual trade show will embrace more than 1,000,000 square feet of exhibits, with the engineering equipment from 490 firms presented in a series of displays at Castle Bromwich, Birmingham—an exhibition hall 12 times larger than New York's Madison Square Garden, with its own railroad terminals and airport, and one of the largest outdoor exhibition areas in the world. Other sections of the Fair, notably the light industries, are to be presented in London's Earls Court and Olympia Hall.

★ ★ ★

Alloy Metal Wire Adds Nickel-Clad Copper to Line

Nickel-clad Copper is a new combination of solid metals—not plated metals. The first step in making Nickel-clad Copper is insertion of OFHC Copper rod into pure Nickel tube. The assembly is then drawn down to any size from ½"-.002"

dia. Nickel-clad Copper is available in round and flat wire, coils or spools; rod from ½"-.03" dia. Also in stranded form direct from any stranded wire manufacturer.

★ ★ ★

Demand for a new metal with resistance to oxidation at high temperatures, plus high heat and electrical conductivity with good strength has now been answered with Nickel-clad Copper. Nickel-clad Copper is being used with excellent results for lead wires . . . electronic tubes, electrical appliances, infra red drying ovens, electrical resistance and induction furnaces. Also, for connecting lines between power supply and electric equipment where high temperatures (anything over 250°F) would oxidize other commonly used metals. Excellent corrosion resistance makes Nickel-clad Copper ideal for fixture wire in chemical plants, refineries, plating and pickling departments.

★ ★ ★

New England Mill To Become Reality

Government approval of the New England Steel Mill Development Corp.'s application for a certificate of necessity assures that a large integrated steel mill will be built near New London, Conn., soon.

★ ★ ★

The mill will be able to turn out about a million tons of flat-rolled products annually. Construction, which will cost about $250 million, is expected to start in about 6 months.

★ ★ ★

Backers of the project stressed that participation by an existing steel company was still open, but that the project would be pushed ahead regardless of the outcome of negotiations.

★ ★ ★

Most of the plant site is now owned by Connecticut, and the remaining land needed will be obtained through the state's power of eminent domain.

★ ★ ★

This is the third large new integrated steel mill to be approved for the East Coast area recently. The other two mills are to be built on the Delaware River below Philadelphia by U. S. Steel Co. and National Steel.

CORRECTION NOTICE ON CANADIAN REGIONAL MEETING

The first hotel reservation cards mailed out to members of the WIRE ASSOCIATION, had a Montreal return address.

★ ★ ★

This is incorrect. *All cards should be returned to the WIRE ASSOCIATION, 300 Main Street, Stamford, Connecticut.*

If you have one of these cards and intend to use it, please send it to Stamford instead of Montreal. New cards are being sent out, however, for your use.

★ ★ ★

Trauwood

ELECTRIC HEAT TREATING TINNING-GALVANIZING AND PROCESS HEATING EQUIPMENT

THE TRAUWOOD ENGINEERING COMPANY offers a complete line of continuous electric patenting, tempering and annealing equipment for wire, rod and strip, tinning and galvanizing installations, and heavy duty electric heating units for the heating of solids, liquids, and gases.

PARTIAL LIST OF USERS

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Armco Steel Corporation
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Improve the quality of your products, increase production and reduce production costs with Trauwood Equipment.

Send us your requirements—Our Engineers will be glad to cooperate with you in solving your heat treating, coating, and process heating problems . . Investigate Today.

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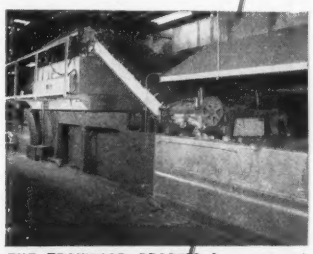
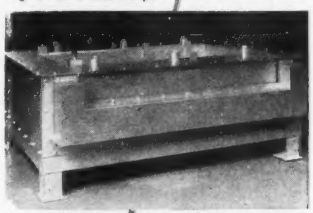
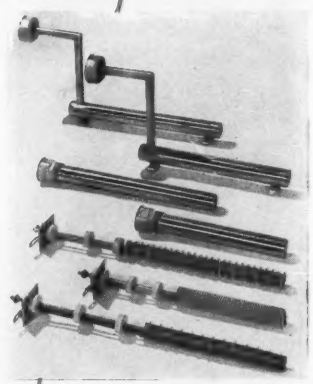


THE TRAUWOOD PROCESS is a new patented principle of wire heating applied to the continuous patenting, tempering, and annealing of wire and strip.



TRAUWOOD electrically heated galvanizing unit for fine wire.



TRAUWOOD electric heating elements for industrial application.

THE TRAUWOOD ENGINEERING COMPANY

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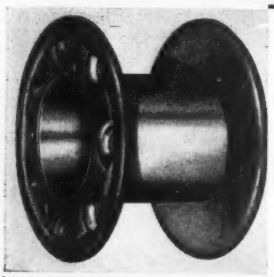
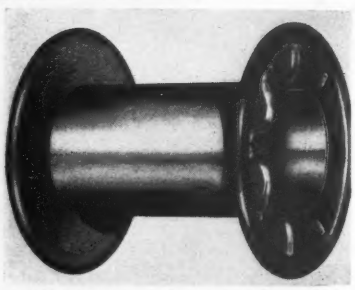


whatever your spool requirement may be . . . .

HUBBARD HAS IT



FOR EXAMPLE . . . if you require process spools, perhaps Hubbard Steel Process Spools will meet your needs exactly. They provide extreme rigidity, are accurately balanced, and are built in all standard sizes for wire drawing and processing.

Whatever your requirement may be, remember Hubbard

Write for information and prices.

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STEEL SPOOLS AND REELS . . . METAL BOUND SPOOLS AND REELS . . . STEEL TRAVERSES . . . LIGHT WEIGHT REELS . . . WOOD REELS

JLE Unit Automatically Controls Wire Diameter

This is the new Electronic Size Control Unit Type A developed by the James L. Entwistle Co. of Pawtucket, Rhode Island. Designed to automatically control wire diameter from rubber or plastic extruders, this JLE unit will control wire size .035 minimum to .375 maximum. The tolerance ranges possible range from minus .000 plus .001 to minus .000 plus .010.

★ ★ ★

New Electronic Size Control Unit Type A by Entwistle

The unit requires only 12″ of space in the wire line and is set up at the take-up end of the production equipment. There is absolutely no mechanical contact with the wire when this unit operates.

★ ★ ★

Complete operational and cost details are available in a special catalog section which can be had on request from Entwistle.

★ ★ ★

Colorado Fuel and Iron Buys Worth Steel Co.

The Colorado Fuel & Iron Corporation has arranged to purchase all of the 60,000 shares of capital stock of the Worth Steel Company

of Claymont, Delaware from members of the Worth family. The Worth family has been in the steel business for more than 100 years.

★ ★ ★

Plans call for diversification of its line of steel products and the new C.F.I. subsidiary will be known as the Claymont Steel Corporation.

★ ★ ★

The Worth Steel plant located on a 650-acre tract along the Delaware River has an estimated annual ingot capacity of 468,000 net tons. Colorado Fuel & Iron has an annual ingot capacity of about 1,560,000 net tons and operates integrated steel plants at Pueblo, Colo. and Buffalo, N. Y., and with its subsidiaries, has six steel manufacturing plants in Massachusetts, Pennsylvania and California. The principal products turned out are wire, wire products, rails and rail accessories and structural steel.

★ ★ ★

Worth's business is primarily the manufacture of steel plate for the ship, tank and heavy boiler trades, and transmission pipe for the oil and gas industries.

★ ★ ★

It is said that investigations are being made for the possibility of expanding operations at Claymont to take maximum advantage of the strategic tidewater location, while at the same time the corporation intends to continue the manufacture of Worth's line of products.

★ ★ ★

No personnel changes are anticipated except at the top executive level.

★ ★ ★

Bulletin Issued on Carbides

The Sintercast Corporation of America, 134 Woodworth Ave., Yonkers 2, N. Y. has prepared a bulletin entitled "Sinterforge Carbides".

★ ★ ★

This is said to contain interesting material on carbides not heretofore published, and gives tables of different tungsten carbide-cobalt combinations and their properties. Also included is a tabulation showing the applications for which each combination is best suited.

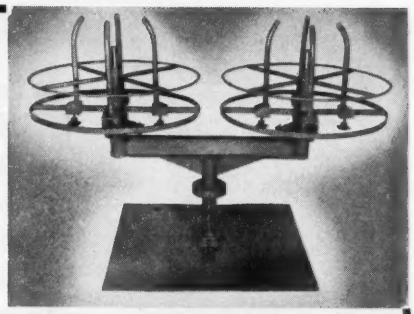
★ ★ ★

Copies of this may be obtained from the above by requesting Bulletin No. SP-101.

Norsholm "Reel Master"

For Easy Loading and Economy

Built in Three Types:



1) HEAVY DUTY DOUBLE REEL, 2) TILT TYPE, 3) SINGLE REEL.

Engineered by men experienced in all phases of wire working, NORSHOLM REELS embody advanced design features that assure increased production. Are rugged and precision made, built for endurance and high efficiency. Models vary from small single reels for light wires to large reels for 500 lb. coils of wire. All are ball-bearing equipped.

With the HEAVY DUTY DOUBLE REEL, shown above, greater yield from wire equipment is possible. As the wire is pulled from one reel, the other is loaded, eliminating down-time. Foot pedal allows reel to index 180° to make ready for new coil.

Also makers of STRAIGHTENING AND CUTTING, WIRE FORMING, and PIN CUT-OFF machines. All fast, dependable, efficient.

Send for descriptive bulletins.

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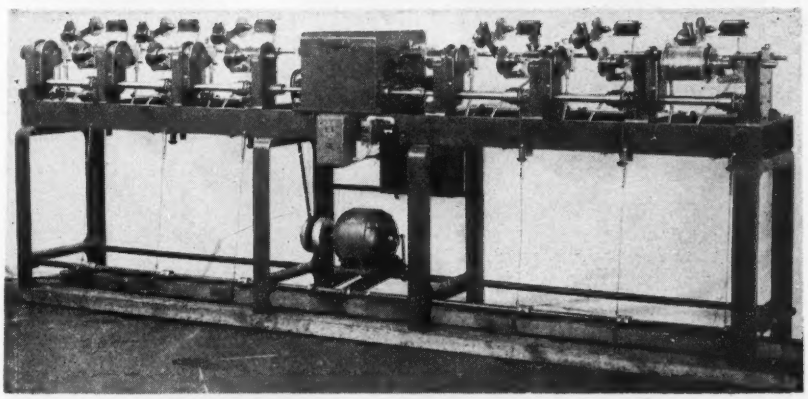
307 WEST AVON RD. **ROCHESTER, MICH.**

MACHINERY FOR WIRE

WINDING • SPOOLING • COILING



Illustrated: Six-Spindle Multihead Winding Machine

The Winder shown above has a main control box with a single screw reversed by a solenoid control for traverse of wire guides. Each head individually controlled by a pre-determined measuring device.

Send for information on this winder and our complete line of BOYD-FIDELITY SPOOLERS

BOYD & SONS MANUFACTURING CORPORATION

1434-38 Callowhill St., **Philadelphia 30, Pa.**

If it's twisted folded pressed crushed shaped braided woven paper

TWITCHELL makes it

treated braiding and wrapping yarns

treated wire-rope cores

slit kraft or jumbo rolls for crushing and wrapping operations.

treated fillers for 2- and 3-wire non-metallic sheathed cable, varnished cambric, shipboard, parkway, and other power cables.

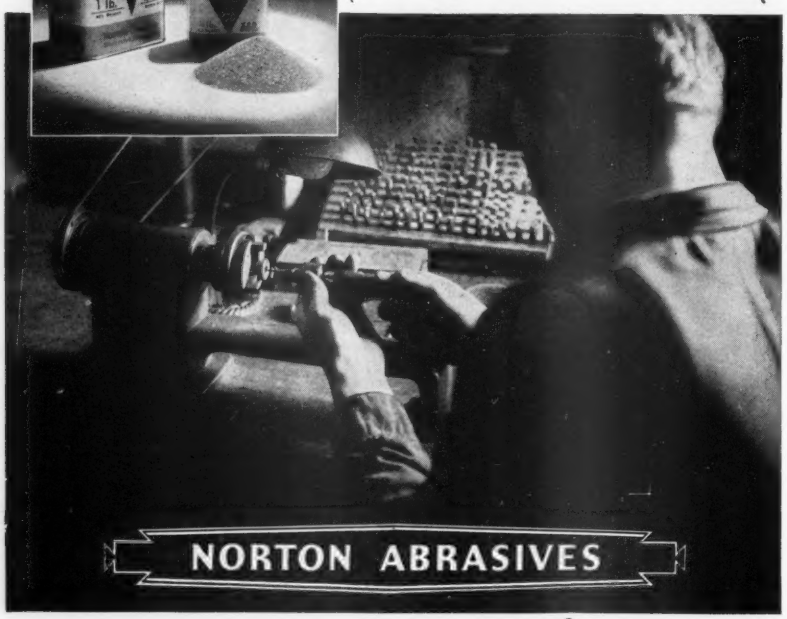
E. W. TWITCHELL INC.

Third & Somerset Streets, Philadelphia 33, Pa.

NORBIDE Abrasive: Effective, Economical

This abrasive—second only to the diamond in hardness and 150 times less expensive—does an efficient job of cutting and semi-finishing cemented carbide wire drawing dies.

NORTON CO. — Worcester 6, Mass.



A Review by Dr. F. R. Morral

HIERRO y ACERO (Enciclopedia Sideruragica) Hugh P. Tiemann, 1st. Spanish Ed. Translated and Published by the Instituto del Hierro y del Acero, Madrid, Spain, 1950; 782 pp.; 4½ x 5⅝ in. Price: 75 Ptas.

★ ★ ★

This pocket encyclopedia on Iron and Steel by Tiemann is well-known and used by many metallurgists. The Spanish Iron and Steel Institute is to be congratulated on having done a fine piece of work in the translation of this pocket reference book. Many metallurgical terms are not to be found in technical dictionaries, but the translators, in going from word to word following Tiemann's alphabetical order, have coined expressions or put down the commonly used technical terminology. This book in addition to making easier the reading of English metallurgical literature by the Spanish reader, will be useful to the English speaking metallurgist in reading Spanish reports. The last 120 pages of the book have a Spanish-English vocabulary. This, unfortunately, refers only to the terms used in the book. We hope that the Spanish Iron and Steel Institute will decide to include the new technical terms which have been added to the metallurgy of iron and steel in the last two decades as a separate pamphlet or as a modification of a new edition.

★ ★ ★

This edition is legibly printed and has the tracings and pictures of the original. The tables have been translated into Spanish, the units very often into the metric system, and the wire gages are given in mms. (p 252-3).

★ ★ ★

New Bulletin on Tank Linings

The Atlas Mineral Products Company announces the publication of their new Corrosion Proof Linings Bulletin No. 4-1. This bulletin describes Atlas' complete line of corrosion proof linings, including: sheet linings, solution or dispersion linings, brick sheathings and miscellaneous linings. Write to 42 Walnut Street, Mertztown, Pennsylvania for your copy.

★ ★ ★

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"Rodine" meets Govt. Specification No.
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STANDARD PICKLING PRACTICE THE WORLD AROUND
CHEMICALS
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For Improved Drawing and Cold Forming . . .

"Granodraw" forms on pickled surfaces a tightly bound adherent, zinc-iron phosphate coating which facilitates the cold extrusion of steel, improves drawing, and lengthens die life.

"Cuprodine" coats both carbon and stainless steels with a thin, bright, adherent layer of copper. This coating prolongs die life and improves the drawing of wire, rod and tubing.

Write for Descriptive Folder

American Chemical Paint Co.
AMBLER ACP PENNA.

SKF to Expand Production of Balls, Rollers

SKF Industries, Inc., in a move to keep pace with increased demands of major industries for anti-friction bearings, announces it will expand productive facilities at its ball and roller plant here.

★ ★ ★

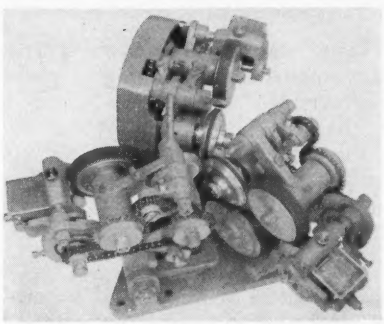
John Lawrence, vice president, said a new addition, providing more than 40,000 square feet of floor space, will enable the company to forestall critical bottlenecks in the manufacture of rolling elements for aircraft and Diesel traction motors, of which it is one of the nation's major manufacturers.

★ ★ ★

Construction of the addition is expected to be started in October. Five to six months will be required for completion, but delivery of new equipment is expected to delay full use of the new facilities until the middle of 1951.

★ ★ ★

JLE Offers New Marking Machine



Entwistle's New Marking Machine

The above photograph illustrates the newest in the **James L. Entwistle** line of wire marking machines. The JLE Type J Wire Marking Machine will print or stripe simultaneously on three sides of insulated wire in three different colors.

★ ★ ★

The machine is operated by movement of the wire and is equipped with precision reservoirs to assure clean, even marking. Type strips can be easily and quickly changed.

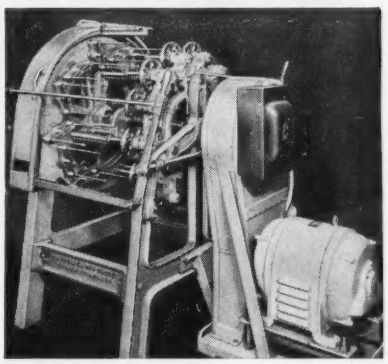
★ ★ ★

JLE catalog sections 18-A 5 & 6 give full details and are available on request.

★ ★ ★

H-D

YOU CAN BUNCH
small diameter
WIRES
on the SINGLE-TWIST PRINCIPLE—Assuring
PERFECT BALANCE and EVEN BUNCH
with this
12-Spindle Horizontal Buncher



Like all H-D equipment, this machine reflects more than 80 years of "know-how" combined with the most advanced technological developments. We can help you solve many of your production problems. Write our engineering department today. This may be your first step to increased efficiency.

The limits of the twisted bunched diameter are .012" to .030" The flyer speed is 2000 R.P.M. All flyers and spindles are ballbearing mounted.
TAKE-UP SPOOL. 5" diameter x 4" traverse x 2¾" barrel. Protected capacity 10.5 lbs. Automatic adjusting tension control.
TWIST RANGE. Capstan controlled overall range 1.0" to .10" lay. Individual machine range 3.3 to 1 ratio of above. For example—.15 to .50 inch lay.
DRIVE. Motor drive with clutch pick-up for controlled starting.
FLOOR SPACE. Machine 5' 6" x 3' 6". Creel space depends on maximum number of wires being bunched.
FOOTAGE COUNTER. Can be installed to stop the machine at predetermined footage requirements.
POSSIBLE USES. The machines are being successfully operated on Litz Wires that fall within the range of the machine, Fourdrinier Wire and many specialties where a precision bunch is required.

HASKELL-DAWES
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Wire Bunchers, Wire Stranders, Special Twisters, Tubing Twisters, Cordage Formers and Layers.

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Investigate Stannochlor — or, if tin in any form has a place in your manufacturing or processing, come to headquarters. We'll be glad to discuss your problems.

METAL & THERMIT CORPORATION
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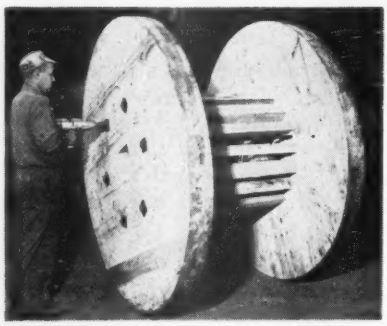
Specialists in Tin

How to Cut Reel Construction Time

The assembly of reels for winding and shipping wire is a time-consuming task, often made cumbersome by the heavy, long-handled hand wrenches used for tightening the reel head nuts. In the belief that the operation could be improved, the American Chain and Cable Co. sought a way to shorten assembly time and reduce operator fatigue, an important factor in putting on the heavy nuts. The Industrial Engineering Department of the Hazard Wire Rope Division at Wilkes-Barre, acquired a tool that accomplishes both of these objectives.

★ ★ ★



Tool for cutting reel construction time * *

Time is saved in two ways. The first eliminates the nailing of parts together. Reel heads are grooved so that the spool spindles can be knocked into the slotted head. When the heads are bolted on, they tighten against the spindles and prevent slippage.

★ ★ ★

The second is the use of a power tool called the "Impactool", which saves about 50% of reel assembly time compared to the old hand-wrench method, and is now in daily use.

★ ★ ★

Reels range in size from 12″ to 74″ reel head diameter with a few special reels of 84″ and 108″ built to order. The smaller sizes use 3 bolts per reel, for which bolts are headed, necessitating nut-running on only one side. On the larger reels, 4, 5 and 6 bolts are used per reel, and both ends must be tightened, since the nuts are run on both heads. The shop makes up between 100 and 150 reels a day, in addition to repairing anywhere from 175 to 100 reels daily.

★ ★ ★

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Master-Made

DIAMOND DIES

Product of MODERN SCIENCE and MASTER CRAFTSMANSHIP

● The tools of modern science are combined with the skills of the master craftsman in the production of PHILIPS *master-made* Diamond Dies.

Every diamond selected for cutting is examined by PHILIPS X-ray diffraction apparatus to determine the proper direction for drilling to provide longer life and greater satisfaction to the user. Master craftsmen of long experience, working under the most modern conditions, drill each diamond to precision tolerances. Result? The finest diamond dies obtainable—now available to American industry under the trade name of NORELCO Diamond Dies.

All sizes . . . from .000275 to .100 are available at competitive prices. Let us consult with you concerning your requirements.

Norelco

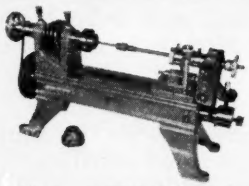
NORTH AMERICAN PHILIPS COMPANY, INC.

Dept. FE-3, 100 East 42nd St., New York 17, N.Y.

NEW **ROOS**

DIE ROOM EQUIPMENT

SEMI-AUTOMATIC POLISHER



MODEL OT — PATENT REGISTERED AND APPLIED FOR

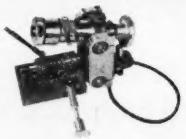
Note these outstanding features for greater accuracy in polishing dies and for prolonged machine life!

(a) Quick opening spindle
(b) Pressure adjustor
(c) New cam assembly
(d) New style leather belt

NEW STYLE TAILSTOCK

To Fit Other Model ROOS Polisher Model OT

NEW



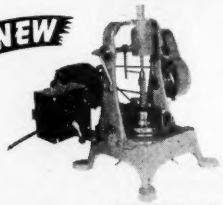
MODEL OT

You can quickly and easily replace the tailstock on your old Roos Semi-Automatic Polisher with the New Model OT-Tailstock. Quotation on this new Tailstock furnished on request.

ROOS

AUTOMATIC DIE SHAPING MACHINE

NEW



MODEL DS-3A

Offers you three improved features: a die rotating attachment; a time switch; and a reversing switch—which provide these advantages:

1. Die rotating attachment and time switch eliminate the formerly necessary constant attention by operator. Rotation of die is automatic, and machine shuts off automatically at end of time cycle.
2. Reversing switch permits rotation of the die in either direction.

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The men using the power tool prefer it because its light weight (9 lbs. 14 oz.) and small size enable them to do this work without fatigue. The company likes it because of its speed and efficiency.

★ ★ ★

The Impactool, made by Ingersoll-Rand, is unique in that it is the first tool in which the impact principle, long used in air tools, has been adapted to an electric motor. The tool operates like any conventional electric drill until the spindle meets resistance. Then the impacting mechanism automatically functions to deliver "extra" power in the form of rotary impacts to the work. Not only are nuts run down more quickly and tightly than by hand, but they can be removed easily and quickly due to the use of a reversible motor. It is a time-saving feature in repairing reels, since even those nuts that are frozen can be spun off in a few seconds.

★ ★ ★

In reel assembly, nut-running is the only application for which the tool is used. With a change of accessories, it may be used for a variety of other operations. In addition to running nuts, it can be used for drilling, reaming, tapping, screw driving, hole sawing, extracting broken cap screws and studs, driving and removing studs, wire brushing and wood-boring. At the Hazard Wire Rope Division, a size 8U tool is used, rated up to $\frac{5}{8}$" capacity. A smaller model, rated up to $\frac{3}{8}$" bolt capacity, is also available. The device operates on AC or DC 110 volt current, but models are also made for 220 volts.

★ ★ ★

Where a plant is not equipped with compressed air, workmen have had to use hand methods. The tool enables the reel department to mechanize its work, putting it on a production basis comparable with the rest of the plant.

★ ★ ★

Waterbury Farrel Foundry and Machine Company Celebrates 100th Anniversary

The year 1951 marks the Centennial Anniversary of the **Waterbury Farrel Foundry and Machine Company,** manufacturers of metal-working machinery at Waterbury, Connecticut.

YOUR LACQUER PROBLEMS
GET SPECIALIZED ATTENTION
AT NEW ENGLAND LACQUER CO.
SPECIALISTS IN PRODUCING LACQUER FOR THE Wire Industry

The approved lacquer for . . .

JAN-C-76

(Military specifications for radio and instrument hook-up wires)

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2. Retains insulation resistance!
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Take advantage of our experience in meeting exact military requirements.

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Mason spools save you money because they cost less — yet satisfy your most rigid requirements for non-returnable use!

Each Mason spool is manufactured by modern mass-production methods that assure sturdy construction at minimum cost. Lithographing operations are efficiently performed in Mason's own plant to maintain exact quality control.

Find out more about how Mason can reduce *your* spool costs. Mason spools are available in all standard head and barrel sizes. Write today for more information!

MASON CAN COMPANY
1949 Dexter Rd., East Providence 14, R. I.
MASON CAN COMPANY OF OHIO
Greenville, Ohio

The Company was founded on March 5, 1851 by Almon Farrel, when his company purchased the Waterbury Iron Foundry Company and re-incorporated it under the name Farrel Foundry. As the business developed, a machine shop was added for the finishing of some of the company's castings and for the manufacture of machine parts and accessories. The foundry portion of the business gradually became subordinated to that of machine building which is the company's present function.

★ ★ ★

During the past century Waterbury Farrel has developed and produced a wide variety of metal-working equipment. The company has contributed many important design advances to equipment in this field. Many types of special purpose machines have been designed and developed by the company's engineering department, and this program of progress continues as the company moves into its second century.

★ ★ ★

Waterbury Farrel's products today are divided roughly into four main categories: Cold Process Bolt, Nut, Screw, and Rivet Machinery; Power Presses and other Metal Products Fabricating Machines; Wire, Rod, and Tube Machinery; Rolling Mill Machinery and Accessory Equipment.

★ ★ ★

To commemorate its centennial the company has issued an Anniversary booklet entitled "100 Years Ago and Now", which gives a detailed history of the company in terms of the administrations of its leading officials. Copies of this booklet can be obtained by request made upon a company letterhead.

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your order now
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1951 Wire Buyers Guide

New Arrival
TYPE "OS"
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Now **Two Types**
Available in 18-gram and 5-gram color-identified, dust-proof cartridges for use with the Hyprez Applicator Gun.

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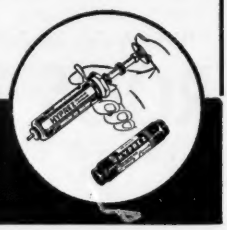
Available in square, round or rectangular 6-in lengths. Address Dept. W-351.



HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. DEARBORN ST. CHICAGO 5, ILL.

Stresses in Small Wire Ropes

(*Continued from page 228*)

stretch of the loaded rope is due to elastic elongation only, without any structural elongation. This last assumption is never 100% true, but the more nearly it is completely fulfilled, the more efficient is the rope, especially as regards its breaking strength.

★ ★ ★

Let us apply the above theory to a specific case.

Let $P = 300\#$
$N = 7$
$n = 3$
$T = 15°$
$t = 6°$
Then $P' = 42.9\#$ (From (1)
$S = 44.4\#$ From (2) and the load on the core strand $= 42.9\#$ From (1)
$s = 14.9\#$ From (4) and (5) with the load on the core wires $= 14.4\#$ From (7)

★ ★ ★

These figures show that the stresses in the outer wires are appreciably higher than those on the inner wires, and explain why, in general, the outer wires will break under load before the inner wires. Assuming that the loads chosen in the above example are practically at the breaking strength of the wire, it would indicate wires with a breaking strength of 15#. If they are drawn to an ultimate tensile strength of 300,000 psi., these wires would have a diameter of .008", giving the small rope a diameter of about .052", Thus it is easy to figure the required wire sizes and strengths to develop a given breaking strength for the finished rope.

★ ★ ★

The above analyses also show why, as is a well known fact, a short lay rope, other things being equal, is weaker than a long lay rope. A short lay rope has a greater angle of lay, and since the secant of an angle increases with the angle the stresses along the strand and wire axes increase correspondingly. For instance, in the above example T was taken as 15°, which corresponds to a rope lay of very nearly .41". If T had been 12°, equivalent to a lay of .52", the stress in the strands along their axes would be 43.8#, instead of 44.4#, a decrease of 1.35% for a lay increase of only

AMCARB

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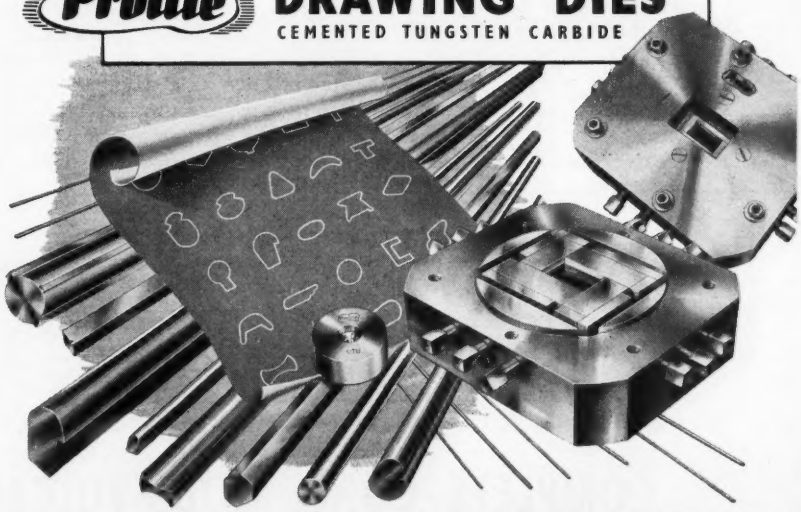
UNION CITY, N. J.

Leading British Manufacturers use

Prolite **DRAWING DIES**
CEMENTED TUNGSTEN CARBIDE



THE 'PROLITE' RANGE OF MUREX METALLURGICAL PRODUCTS *includes:*

Tungsten Carbide Tips and Tipped Tools, Bar, Tube and Wire Drawing, Extruding and Metal Forming Dies and Die Pellets, Cold Heading Dies, Nozzles, Guides, Bushes and other Wear Resisting Parts.

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Sjogren - DOGS

LIKE other S & S products are rugged; they stand use—and abuse. These dogs are simply made and easy to maintain. Ordinary pressure upon the thumb-screw locks them in position. Assurance they will hold their setting relieves worry from the possibility of the dog turning on the block-pin while in use. S & S dogs are made with a large body and full face; giving ample support to wire being coiled. All sizes of Sjogren Dogs may be attached or removed from the block-pins without lost time or removal of the end plates.

Used by Wire Men Who Want the Best!

SJOGREN TOOL AND MACHINE CO., INC.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

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MASSACHUSETTS

Represented in Canada by THE LARSON CO., 98 Wellington St., West, Toronto, Ont.

.11". All this indicates why the main span cables of suspension bridges are made up of compacted bundles of perfectly straight wires, instead of the usual rope construction, so as to develop the full axial strength of the wires.

★ ★ ★

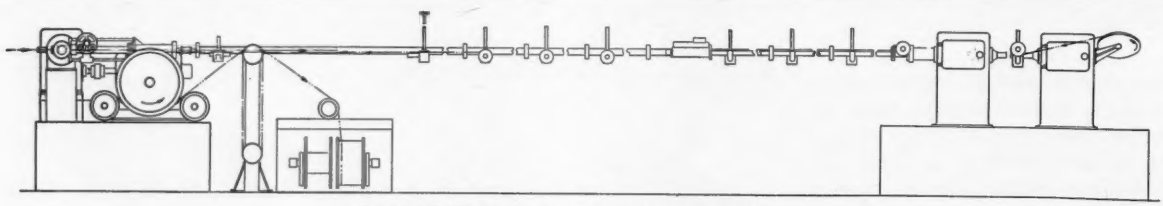
Since the stresses in the outer wires, for any given load on the rope, are greater than those in the inner wires, so that the outer wires tend to break first, one would expect that by increasing the breaking strength of the outer wires somewhat a point can be reached where all wires break approximately simultaneously, so that the rope breaks at once as a whole, thus developing its maximum strength. Thus, in the example given, if all the outer wires were to have a breaking strength of 15#, with all the core wires breaking at 14.5#, all the wires in the rope should theoretically break simultaneously.

★ ★ ★

It is interesting to follow the interplay of tensions in the strands and wires when a load is applied to a rope, as in a tensile testing machine. In the early stages of the loading we know that our initial assumptions are not completely fulfilled. Some of the wires and strands may be relatively loose, and some relatively tight, so that the load on the rope will not be equally distributed over the component parts. But as the load increases the loose strands and wires will become tighter and more firmly compacted within themselves, and with their neighbors, the stretch and twist in the rope due to these re-adjustments will disappear, and we can now expect our initial assumptions to be more nearly realized. It is at about this point, when the rope load is 50% to 60% of the rope's ultimate strength, that the above analysis begins to represent the actual conditions within the rope.

★ ★ ★

In the above discussion we saw that if all the outer wires had the same breaking strength, about 3½% greater than the core wires, which in turn were all of equal strength, the rope could be expected to break as a whole, instead of wire by wire. But since such an exact distribution of wire strengths is, in general, impractical for commercial manu-



DAVIS-STANDARD CONTINUOUS VULCANIZING EQUIPMENT

COMPLETE CONTINUOUS-VULCANIZING UNITS

THE STANDARD MACHINERY COMPANY, MYSTIC, CONN., U. S. A.

Established in 1848 — *Incorporated in 1875*

Export Office: Drexel Bldg., Philadelphia 6.
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Chicago: Grant Engineering Co.
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facturing, it will be of interest to follow the sequence of events after the first wire, usually an outer one, breaks. The total load is then distributed over (n-1)N wires, instead of nN wires, so that the next weakest wire, subjected to this greater unit load, will soon break, leaving (n-2)N to take the load. This process will rapidly continue, progressively, until so many wires are broken that the rope becomes distorted, stretched, and loose, so that it can sustain practically no load at all. After the first few wires are broken the initial symmetry and compactness of the rope is rapidly lost, and the resulting stretch, twist, and distortion will make further analysis quite impossible. But it is believed that, from a load of 50% to 60% of the rope's ultimate up to the breaking of the first one or two wires the above analysis is a fairly exact picture of what goes on amongst the strands and wires of a loaded rope.

★ ★ ★

Referring again to Fig. 1, there is another component of P′, namely C, acting at right angles to S in such a way as to bind and tighten the strands to each other and to the center strand. While the values of C, for the strands in the rope, and the wires in the strands, can be readily calculated, they are of little interest as compared with the wire and strand axial stresses, as derived above.

★ ★ ★

New Hunter Spring Buyer's Guide Covers Cost Factors

A new eight-page bulletin, "Spring Buyer's Guide", designed to aid economical purchasing by reducing to understandable terms the various factors affecting the cost of coil springs, has just been published by the **Hunter Spring Co.**, Lansdale, Pa. Intended primarily for the use of spring buyers, the guide will also be valuable to production men, engineers, inspectors and all others who deal with springs.

★ ★ ★

A glossary of spring maker's terms gives 38 terms commonly used in the design, manufacture and specification of coil springs.

★ ★ ★

The bulletin may be obtained by writing Spring Division, Hunter Spring Co., Lansdale, Pa.

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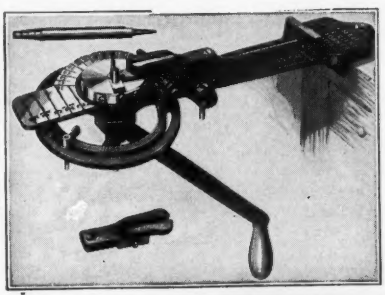

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The Use of Tungsten Carbide Dies in Wire Drawing & Nail Material

(*Continued from page* 217)

cause as soon as the wire mills found out they had no outlet for poor quality material, wire drawing supervision was more critical and the quantity of rejects dropped appreciably.

★ ★ ★

Once the nail wire specifications were decided upon, other problems related to the use of the new tungsten carbide nail gripper dies were analyzed. It was found that the maintenance of the nail machines had to be excellent, as sloppy repair work seriously affected the life of the new dies. Furthermore, it was determined that the die boxes had to be in very good condition and reasonable tolerances maintained. In fact they actually became an integral part of the gripper dies. Accordingly some nail mills have set up die shops so that their personnel will be responsible for both the nail dies and die boxes. No longer are the millwrights and operators allowed to repair the die boxes.

★ ★ ★

Another major operational change had to be made in order to make the tungsten carbide nail gripper dies effective. In that these new dies are precision made tools, it was deemed necessary to have the nail machine operators cease touching up their dies on emery wheels, as was the case with the steel dies which were not precision made and therefore required dressing so as to properly grip the wire. The complete responsibility for the satisfactory making of dies rests with the head die maker in the nail mill and, in the event of difficulties with the dies, he is responsible, through his men in the die room, to straighten out these problems.

★ ★ ★

It has been found that the original cost of a pair of tungsten carbide nail dies is approximately ten times as great as that of regular steel dies, although the life per dressing is twenty times as great. Moreover, a carbide nail die can be dressed just as many, if not more times than a steel die, and at no greater expense. Therefore, it is only natural that a more uniform and higher quality of nail can be maintained using the

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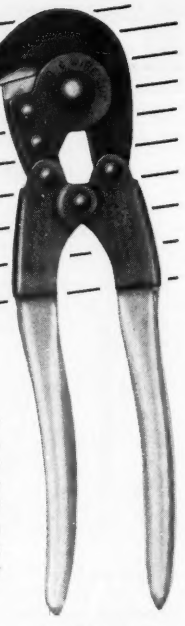

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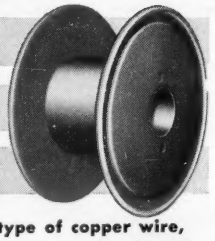

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carbide nail dies.

★ ★ ★

The longer life per dressing that can be obtained from the carbide nail die, as compared to the steel die, is of most importance as it lowers the cost of labor per ton of nails produced. This is true as the decreased time spent changing dies, etc., can be more effectively used by the operator in keeping a greater number of machines in operation. Also, greater machine efficiency results.

★ ★ ★

Of extreme interest is the combined effect of the tungsten carbide wire drawing and nail gripper dies on the men who operate the nail machines; namely the nail machine operator who changes the tools and adjusts the machines, and in that capacity is responsible for the product; and the nail machine helper, whose primary duties are to keep the nail machines supplied with wire and to take away the finished product.

★ ★ ★

A few years ago a good nail operator was one who, with not too good a quality of wire, with respect to gauge and finish, reasonably good dies, and machines in fair condition, could produce a passable nail as a result of his skill and ingenuity. Gradually this situation has been changing, largely due to the introduction of carbide wire drawing dies, which resulted in greatly improved wire quality regarding gauge and finish, and more recently due to the use of the tungsten carbide nail dies. As a result, the operator's job has been considerably deskilled.

★ ★ ★

The work of the nail helper, per ton of nails produced, was appreciably reduced by the change from the approximate 200 pound wire bundle of some years ago, to the present 500 to 1200 pound bundle, this improvement being primarily attributed to the use of carbide wire drawing dies.

★ ★ ★

In conclusion, it can be fairly stated that the tungsten carbide wire drawing die is the hub about which a modern wire mill is built. Although the latter part of this paper has traced the progressive changes

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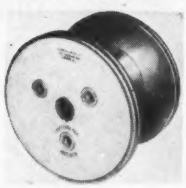

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made in a current nail mill, as a result of carbide dies, a similar story could undoubtedly be written concerning most of the up-to-date wire fabricating plants throughout the world.

★ ★ ★

Reynolds Metals Issues New "Aluminum Data Book"

A 194-page publication, "The Aluminum Data Book", has just been issued by Reynolds Metals Company, Louisville, Ky., to meet the demand for more factual information on aluminum alloys and mill products.

★ ★ ★

Aluminum is no longer a single metal but a large family of metals, each with its own peculiar properties. To make an intelligent selection, the user must have definite information as to alloys, tempers, sizes, shapes, physical properties, chemical properties, mechanical properties, and fabricating characteristics.

★ ★ ★

These vital facts on aluminum alloys and mill products have been condensed into a handy pocket-size manual which contains 117 tables of data on physical, chemical, and mechanical properties; standard tolerances; weights; standard sizes and production limits; as well as much fabricating data. Included are tables showing relative corrosion resistance, the action of many chemicals on aluminum, elevated and low-temperature properties, fatigue strengths, minimum bend radii, joining methods, finishes for aluminum, and much other information.

★ ★ ★

A condensed table of contents on the title page quickly indicates where to look for more detailed information. The tables are covered in a special table of contents. All tables have been carefully arranged in groups for ready reference.

★ ★ ★

Wire bound to permit flat opening, this 6 x 9-inch book also contains 61 illustrations showing various operations in the production of aluminum. It will be sent without charge to engineers, designers, and technical men who request it on company letterhead. Address Reynolds Metals Company, 2500 South Third Street, Louisville, Ky.

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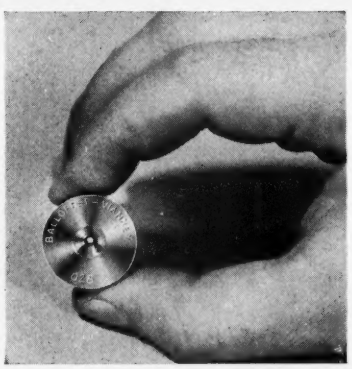

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Bristol Brass Booklet Marks Firm's 100 Years

The history of the **Bristol Brass Corporation,** Bristol, Conn., founded 100 years ago, is presented in a new book entitled "Bristol Fashion." The story emphasizes the foresight and practical mindedness of the early founders and the ability of their successors who have carried on.

★ ★ ★

The company was originally known as the Bristol Brass & Clock Company, formed by sixteen Connecticut industrialists. The problems of these early pioneers are described in a manner which preserves the environment in which they were located and this history is full of human interest. The growth of the business and the various operational details are covered.

★ ★ ★

Israel Holmes, the first president, was succeeded by Elisha Welch, president of Bristol Brass for 36 years. He possessed uncanny aptitude which enabled him to circumvent numerous financial disasters. The important roles played by eight other presidents including Roger Gay the present executive are outlined.

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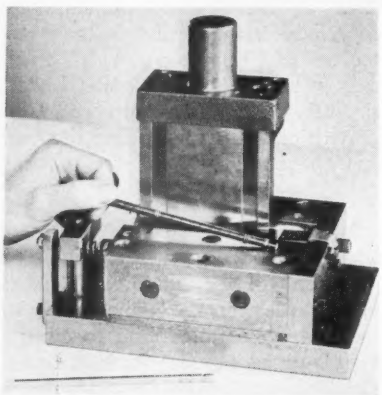
New Carboloy Carbide Blanks Used to Form Threads

A simple rolling fixture, faced with blanks of Carboloy cemented carbide, and used in a #21 Bliss press, is doing the job of a thread generating machine in the Appliance & Merchandise Department, General Electric Company.

★ ★ ★



Thread Generating Machine

* * *

The operation consists of rolling two spiral grooves .020" deep in .260" diameter fan rotor shafts. The fixture rolls the shaft downward past two blades of Carboloy cemented carbide set at the proper helix angle. It is estimated the Carboloy blades need repolishing only after around 200,000 pieces. High speed blades have also been tried in this operation and a total of 60,000 pieces obtained over the tool life (representing 10 re-grinds).

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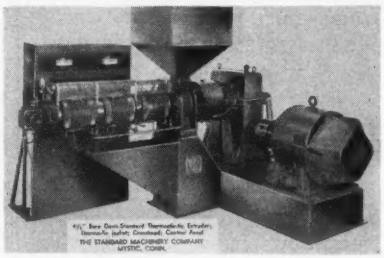
New Heater-Cooler Jacket Developed

Therma-Fin is the name given this new heater-cooler jacket for extruding machine cylinders by **The Standard Machinery Company,** Mystic, Conn. The Therma-Fin is



New Therma-Fin * * * * *

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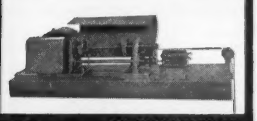
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ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ACID-PROOF CONSTRUCTION—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Machy. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy., Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp, The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
American Steel & Wire Company, Cleveland, Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
U. S. Steel Export Company, New York, N. Y.

BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Houghton, E. F., Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
The Parkin Chemical Company, Pittsburgh, Pa.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Holden, A. F., Company, The, Detroit, Mich.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, O.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Techema Co., The, Toronto, Canada

COMPOUNDS—Diamond
Eastern Carbide Corp., New Rochelle, N. Y.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CORROSION PREVENTIVES
Angier Corporation, The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Diamond Distributors, Inc., New York, N. Y.
Diamond Tool Research Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Diamond Distributors, Inc., New York, N. Y.
Diamond Tool Research Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
National Research Company, St. Claire Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING
Diamond Tool Research Co., New York, N. Y.
National Research Company, St. Claire Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Diamond Tool Research Co., New York, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Metal Carbides Corporation, Youngstown, Ohio.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hartley Tool & Die Co., Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
American Carbide Die Company, Union City, N. J.
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

WHERE TO BUY, Continued

DIES—Special Shapes, Etc.
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Ft. Wayne, Ind.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Swaging
Murex, Ltd., Rainham, England.
Sjogren Tool and Machine Co., Inc., Auburn, Mass.

DIES—Tantalum Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tube Drawing
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tungsten Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
National Rubber Machinery Co., Akron, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

DRYING EQUIPMENT—Plastic Comp. Ovens
National Rubber Machinery Co., Akron, Ohio.

ENGINEERS—Consulting
Copper—Leonard D. Walde, Seekonk, Mass.
Metal Fatigue—Fatigue of Materials Laboratory, Princeton, N. J.
Spring Design—Carlson Co., The, New York, N. Y.
Wire Mill—Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Company, The, Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Michigan Oven Co., Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Clevel nd, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.
Holden, A. F., Co., The, Detroit, Mich.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Michigan Oven Co., Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOOKS—Pickling & Liming
Bronze Die Casting Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin Chemical Company, The, Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.
Owens Corning Fiberglas Corp., Toledo, O.
Twitchell, E. W., Philadelphia, Pa.

INSULATING MATERIALS—Paper—For Electric Wire Cable.
Merrimac Paper Co., New York, N. Y.
Twitchell, E. W., Philadelphia, Pa.

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Roos, Tool & Mfg. Co., Montclair, N. J.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

LUMBER—Wire Mill, for lagging and car blocking
North Anson Reel Co., North Anson, Maine.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Wean Engineering Co., Cleveland, Ohio.

MACHINERY—Bead Wrapping
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Eisler Engineering Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coilers
Boyd & Sons Manufacturing Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Cold Heading
(See Cold Headers)

MACHINERY—Copper Wire Drawing and Rolling
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Rubber Machinery Co., Akron, Ohio.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kagan-Dixon Industries, Inc.
Kelly Wire Die Corp., New York, N. Y.
Roos Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wickman, A. C., Ltd., Coventry, England.

MACHINERY—Draw Benches
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
National Rubber Machy. Co., Akron, Ohio.
Royle, John, & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Rubber Machy. Co., Akron, Ohio.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio

MACHINERY—Pointing
Aetna-Standard Engineering Co., Youngstown, Ohio
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
National Rubber Machy. Co., Akron, Ohio.
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
National Rubber Machy. Co., Akron, Ohio.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Kagan-Dixon Industries, Inc., Rahway, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd & Sons Manufacturing Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Mach'y Exch. (Used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Spring Making
Lundahl Corp., Hartford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Heller & Paul, Inc., Tujunga, Calif.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Norsholm Industries, Rochester, Michigan
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Forming
Wickman, A. C., Ltd., Coventry, England

MACHINERY—Strip Steel
Aetna-Standard Engineering Co., Youngstown, Ohio
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

WHERE TO BUY, Continued

MACHINERY—Testing Physical
Lundahl Corporation, Hartford, Conn.
Scott Testers, Inc., Providenec, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I. (used)

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Marshall-Richards Machine Company, Inc., Trenton, N. J.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply, Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Winding Wire
Federal Manufacturing Co., Wallingford, Conn.
Standard Mill Supply, Pawtucket, R. I.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna-Standard Engineering Co., Youngstown, Ohio
Davis, R. L. Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Standard Machine Co., Mystic, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Youngstown, Ohio
American Insulating Mach'y Co., Phila., Pa.
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Heller & Paul, Inc., Tujauga, Calif.
Kilmer, M. D. & Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MACHINERY—Wrapping Straight Lengths and Tubing
Angier Corporation, The, Framingh m, Mass.
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Wrapping Wire Coils
Angier Corporation, The, Framingh m, Mass.
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc, Cortland, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.

OVENS—Dehydrogenizing
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Michigan Oven Co., Detroit, Mich.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corporation, The, Framingh m, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See Wind-up and Unwind Systems)

PHOSPHATE COATING CHEMICALS
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Bronze Die Casting Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS—
Entwistle, Jas. L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

PRESSES—Hydraulic and Mechanical
Standard Machinery Co., Mystic, Conn.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

REEL AND TENSION STANDS—
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Roll-a-Reel, Cincinnati, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Roll-a-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Plastic
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
North Anson Reel Co., North Anson, Maine.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

WHERE TO BUY, Continued

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
(See Ovens—Rod Bakers)

RODS—Aluminum
Kaiser Aluminum & Chemical Sales, Inc., Oakland, California

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J
U. S. Steel Export Co., New York, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SALTS—Heat Treating, Descaling, etc.
Holden, A. F., Co., The, Detroit, Mich.
Houghton, E. F. & Co., Philadelphia, Pa.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

SOAPS—Industrial and Wire Drawing
(See Compounds—Wire Drawing)

SODIUM—for Descaling
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Holden, A. F., Co., The, Detroit, Mich.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

TANKS—Steel
Chemsteel Construction Co., Pittsburgh, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TIES—WIRE—
(See Wire Ties)

TINNING PROCESS—
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Metal & Thermit Corp., New York, N. Y.

TINSEL—Cords, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

TINSEL—Electric Resistance
(See: Tinsel—Electric Conductor)

TINSEL—Lame, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Wire
(See: Tinsel—Electric Conductor)

TOOLS—Spring Forming
Lundahl Corporation, Hartford, Conn.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, Jas. L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attlebore, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
H. D. Kilmer Co., Cleveland, Ohio.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.
Malin & Co., Cleveland, Ohio.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Montgomery Co., The, Windsor Locks, Conn.

WIRE Manufacturers
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specifications for Special Purposes
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, N. Y.
American Steel & Wire Co., Cleveland-Chicago, New York.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Specialty Wire Co., Inc., Worcester, Mass.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., New York, N.Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N.J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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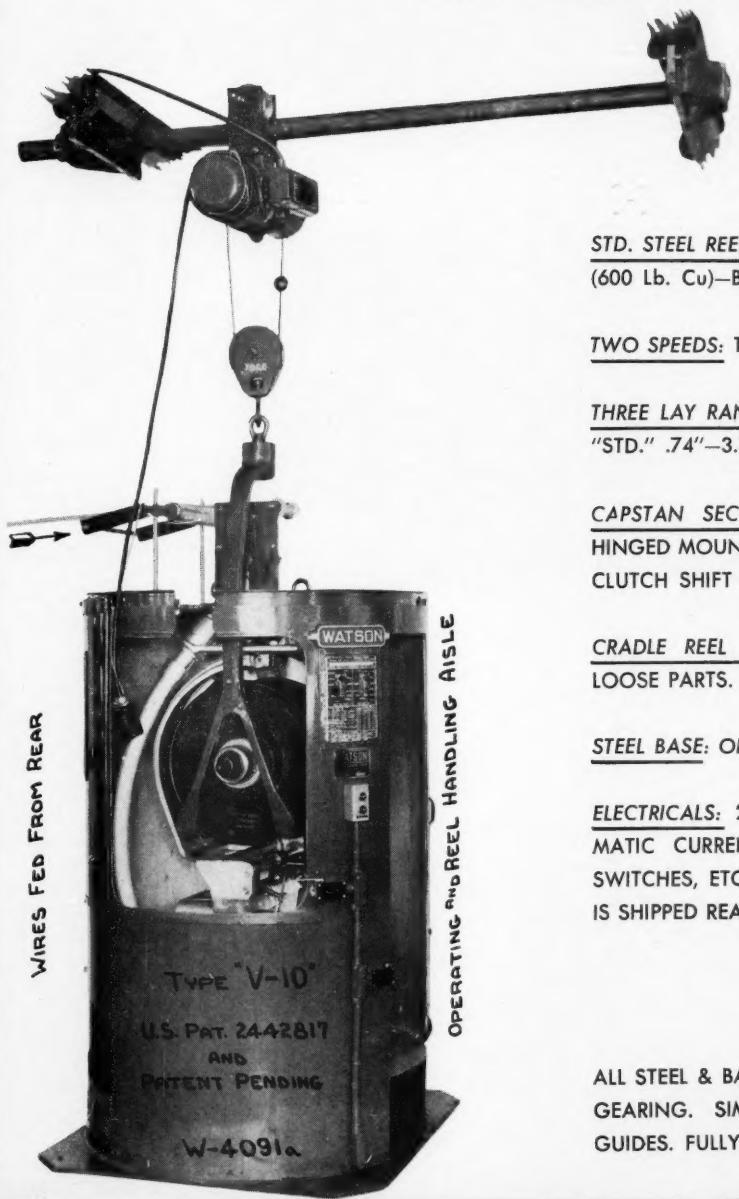

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TWO SPEEDS: 1450 & 965 TWISTS PER MINUTE.

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CAPSTAN SECTION: HEAVY DUTY DOUBLE GROOVED. HINGED MOUNT SIMPLIFIES LAY GEAR CHANGE. EXTERNAL CLUTCH SHIFT SIMPLIFIES HAND OF TWIST CHANGE.

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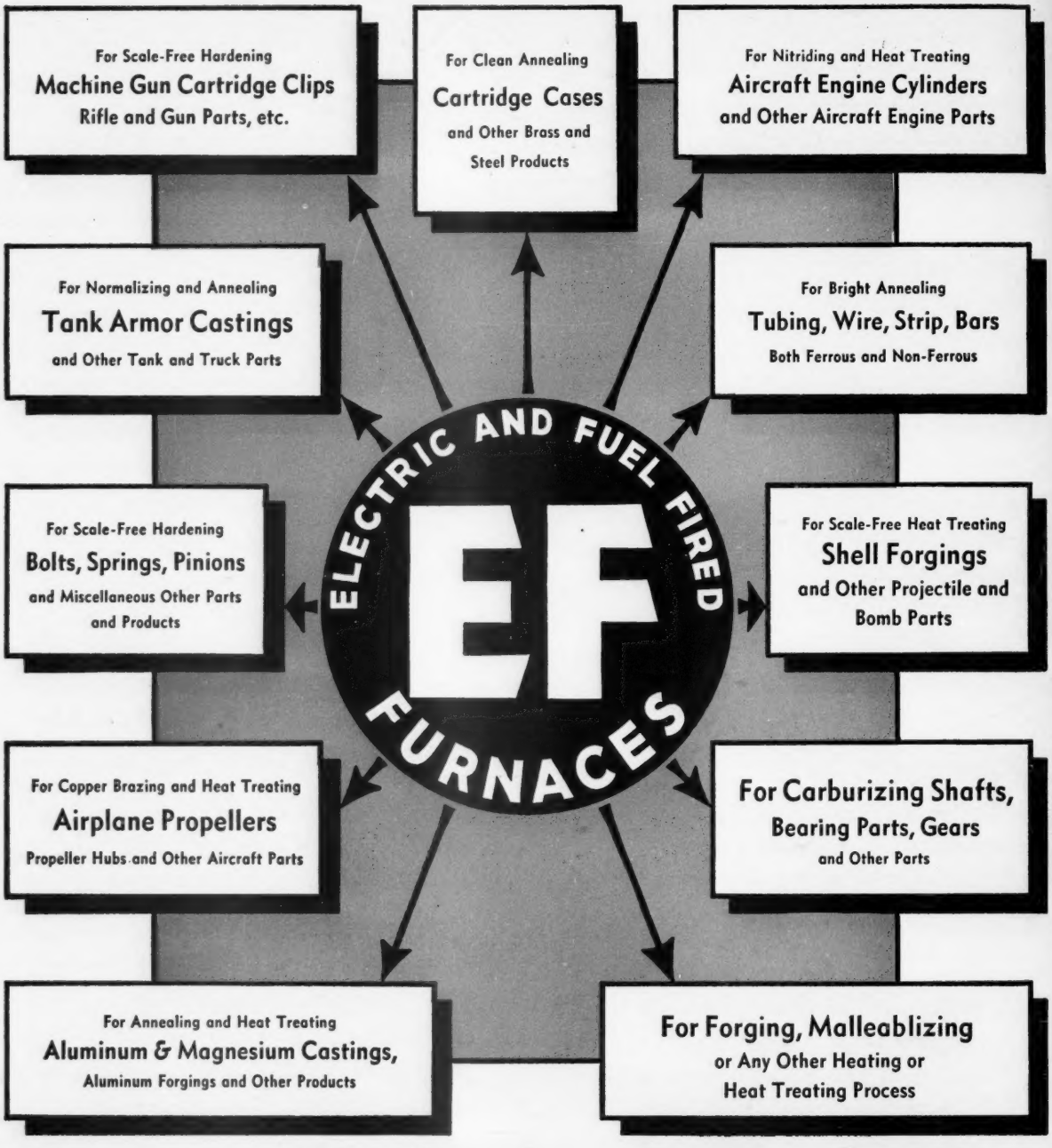

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